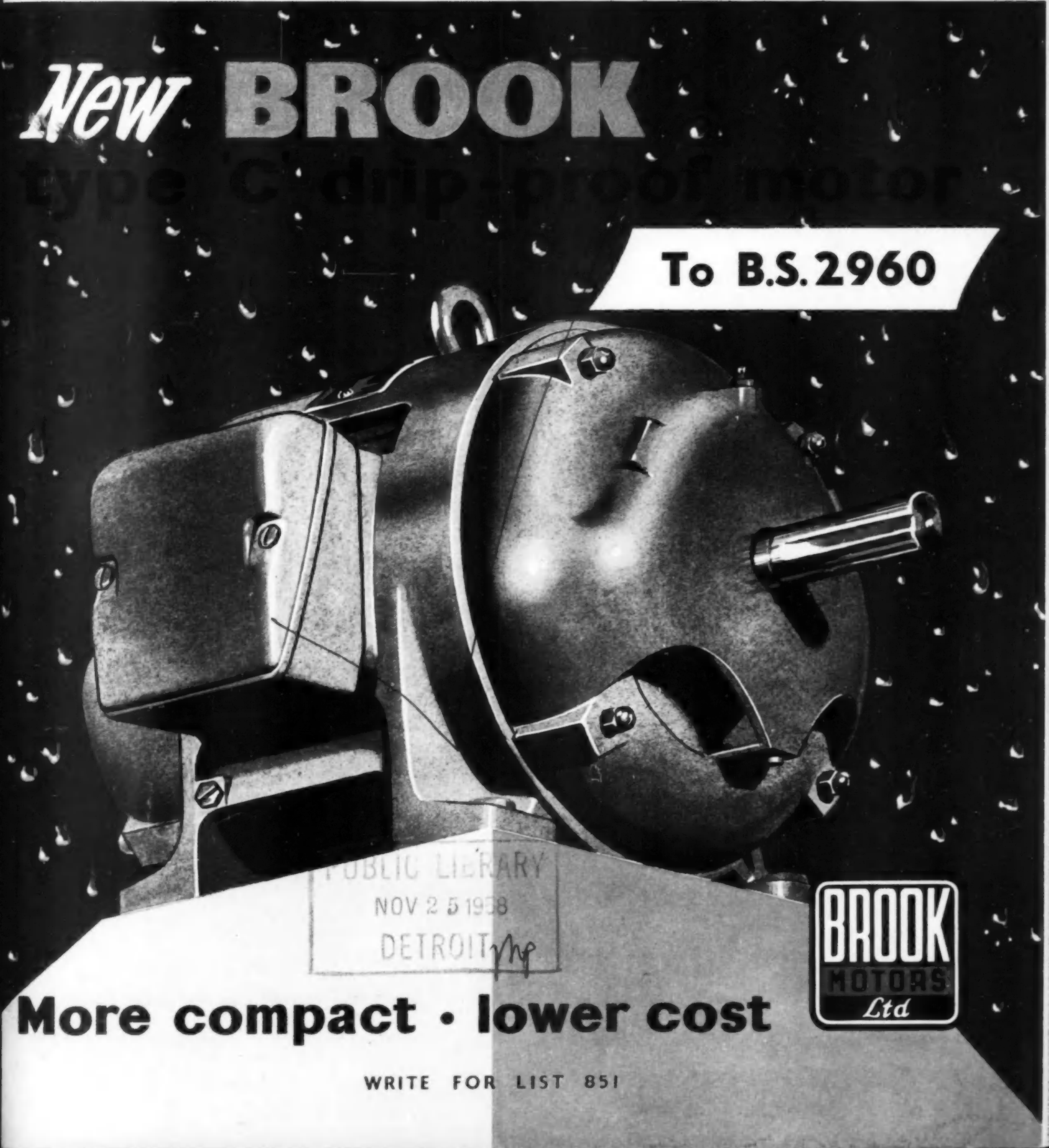
ELECTRICAL REVIEW

FRIDAY
VEMBER 1958

WEEKLY
PRICE 1s 6d


New BROOK
type 'C' drip-proof motor
To B.S. 2960
BROOK MOTORS Ltd
More compact • lower cost
WRITE FOR LIST 851

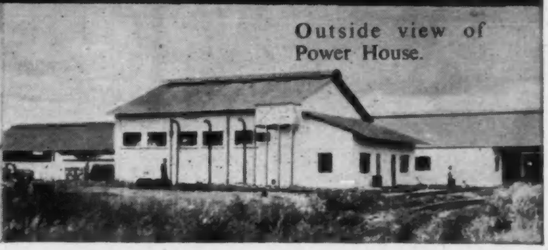
PUBLIC LIBRARY
NOV 25 1958
DETROIT

Ever increasing power demands
PIRELLI GENERAL
oil-filled cables
33kV
66kV
132kV
275kV
301kV
330kV

PIRELLI-GENERAL CABLE WORKS LTD., SOUTHAMPTON.

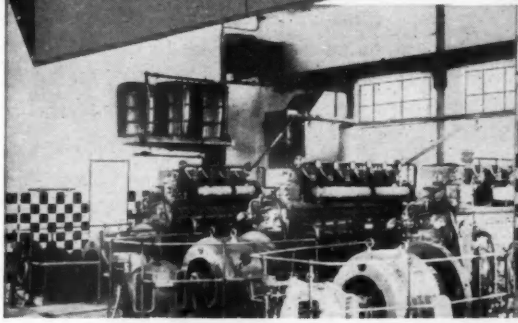
"Erskine Heap" Switchgear in a Sisal Factory

General view of new Kingolwira Sisal Factory from main road.

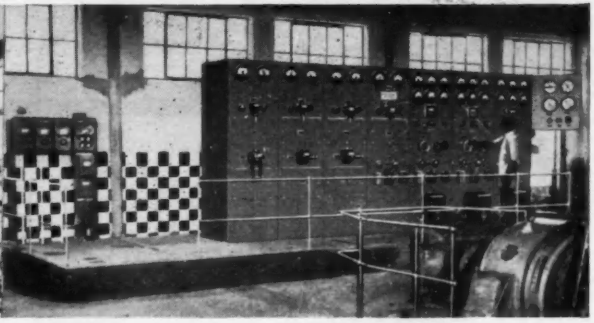


Outside view of Power House.

Switchboard controls three diesel Alternator sets and outgoing feeders with duplicate bus bars so that the output of any arrangement of Alternators can be selected.



Engines and Alternators.



Main Switchboard in Power Station.

The Factory where the above installation is situated belongs to The Central Line Sisal Estates Ltd. and is situated near Morogoro, Tanganyika, and replaces two old factories. The numerous small engines in the existing Factories were replaced by the new diesel electric station which now also supplies the power for 3 kV transmission line to supply power for the pumps at the river.

Main Contractors: Lancashire Dynamo & Crypto Ltd.
Consulting Engineer: P. Eyre, M.I.Mech.E., Assoc.I.E.E.

ERSKINE, HEAP & Co LTD
SWITCHGEAR SPECIALISTS
Head Office & Works BROUGHTON, MANCHESTER (7)
London Office GRAND BUILDINGS, TRAFALGAR SQ., W.C.2
BRANCH OFFICES AND AGENCIES IN ALL PARTS OF THE WORLD

MK

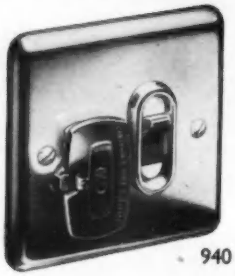
To meet IEE Regulation 314

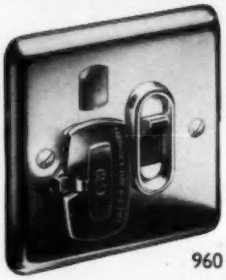
Fused SPUR-BOXES *with DP switches*

MK160DHB

WITHOUT PILOT-LAMP

WITH PILOT-LAMP


940


960

941

961

942

962

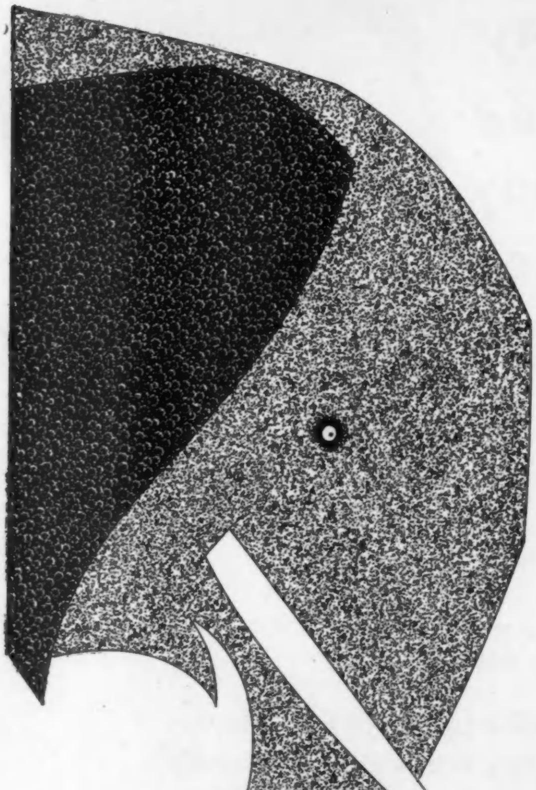
THIS NEW RANGE is designed to give a neat and simple solution to the problem of installing fixed appliances to conform with I E E Regulation 314. The double pole switch disconnects the appliance from all live supply conductors. The fuse-carrier contains a 13 amp cartridge fuse-link to BS 1362. Flush types are made with moulded plates finished brown or ivory, and brass plates finished BMA or matt chrome. Surface metalclad units have steel boxes and cover plates finished aluminium stove enamel. All types are available with or without pilot-lamps.

Flush insulated units can be converted for surface mounting by using the conversion box *List No.* 2030. All flush spur-boxes have 2⅜″ fixing centres for mounting in BS 1363 boxes. Write for leaflet 247.

MK

. . . the mark of progress

M. K. Electric Limited, Wakefield Street, London N.18   Edmonton 5151



LARGE or **small**

HV. or **LV.**

it's agreed

DAVENSET

TRANSFORMERS

Of course!

PARTRIDGE WILSON & CO. LIMITED LEICESTER

Can you say sturdy steel jacketed heater units for steady heating in shaky places six times, quickly?

It's a mouthful, but fortunately you only have to say it once, preceded, of course, by the name CRESSALL.

CRESSALL Steel Jacketed Heater Units are made to the very highest possible standard and a very wide range is manufactured, adaptable, where possible, to individual requirements.

STEEL JACKETED HEATER UNIT
TYPE No. 2020
475 WATTS 200-250V
THE CRESSALL MANUFACTURING CO. LTD. BIRMINGHAM, ENGLAND
THE CRESSALL MANUFACTURING CO. LTD. BIRMINGHAM, ENGLAND

Forty years' experience in design and manufacture are behind each CRESSALL Steel Jacketed Heater Unit, which has that extra margin of durability so necessary for withstanding constant wear and hard usage.

Write for Catalogue Section B List 82

Cressall

A.I.D. & A.R.B. APPROVED

THE CRESSALL MANUFACTURING COMPANY LTD.
(A subsidiary of The Expanded Metal Co. Ltd.)

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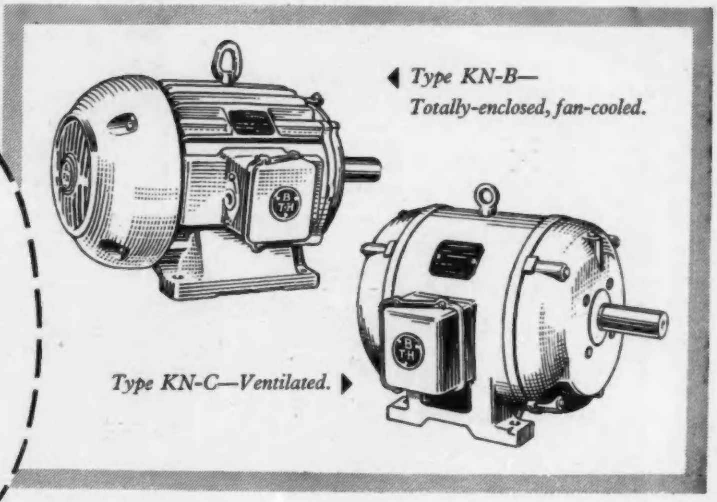
LONDON OFFICE: BURWOOD HOUSE · CAXTON STREET, S.W.1 · TEL: ABBEY 7766

B T-H

please to remember

the First of November

IMPORTANT PRICE REDUCTION
for
BTH British Standard Dimension Motors



◀ *Type KN-B—*
Totally-enclosed, fan-cooled.

Type KN-C—Ventilated. ▶

Take advantage
of the price reduction—
effective from 1st November, 1958
—for these high quality motors.
Most sizes are available
from stock. Further details
are given in Publication G13032.
Please write for
your copy.

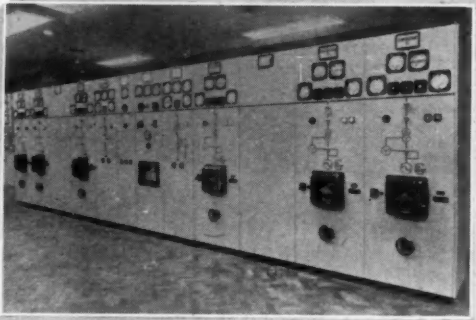
BRITISH THOMSON-HOUSTON
THE BRITISH THOMSON-HOUSTON CO LTD · RUGBY · ENGLAND
an A.E.I. Company

A 5336

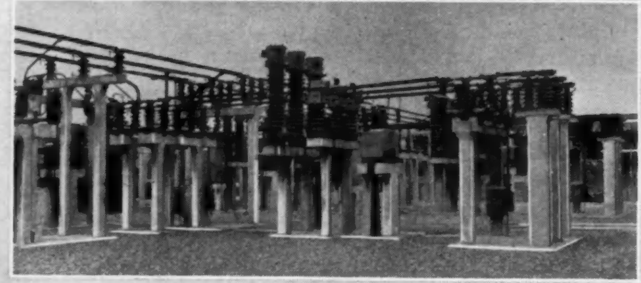
ROLLS-ROYCE LTD. DERBY. AERO ENGINE ALTITUDE TEST PLANT

WITH SWITCHGEAR SUPPLIED BY REYROLLE

The 33-kV 1000-MVA small-oil-volume switchgear and ancillary equipment controlling the supply to the six 22,000-H.P. compressor-motors was manufactured and installed by Reyrolle



Photographs by courtesy of Rolls Royce Ltd.
Consulting Engineers: McLellan and Partners in association with Messrs. Merz and McLellan



Reyrolle

A. REYROLLE & CO. LTD. HEBBURN COUNTY DURHAM ENGLAND

THE

ROLLS-ROYCE

AIRCRAFT ENGINE ALTITUDE TEST PLANT

AT DERBY

HAS THREE

Precipitron

REG. TRADE MARK
SOLE LICENSEES

ELECTROSTATIC AIR FILTERS

for cleaning air supplies

PLANT 'A' cleans 320,000 c.f.m. for the main compressor system in the Exhauster Station building.

PLANT 'B' cleans 160,000 c.f.m. for the compressor system in the Input Circuit building.

PLANT 'C' cleans 224,000 c.f.m. supplied direct to the aircraft engine under test.

This plant is among the largest electrostatic air filter installations in this Country.

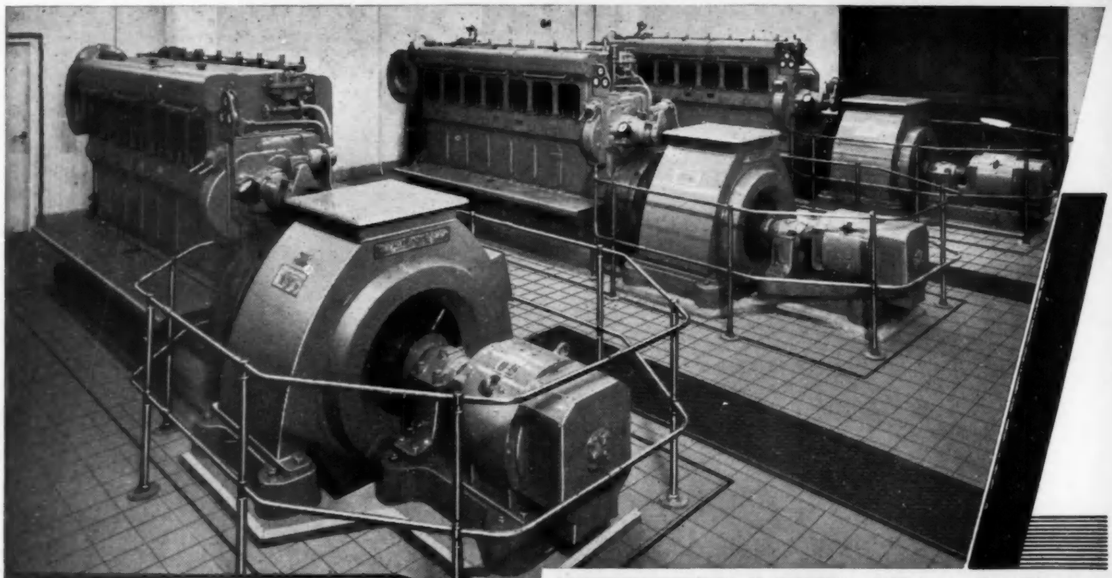
PRECIPITRON was chosen because it measures up to Rolls-Royce standards.

Consulting Engineers, McLellan and Partners in association with Merz and McLellan.

Electrostatic Air Cleaning was pioneered by Sturtevant in the United Kingdom with PRECIPITRON Air Filters detailed in our publication U7106.

STURTEVANT ENGINEERING CO. LTD.
Southern House, Cannon Street, LONDON, E. C. 4.

AUSTRALIA: STURTEVANT ENGINEERING CO. (AUSTRALASIA) LTD. 400 SUSSEX STREET SYDNEY N.S.W.



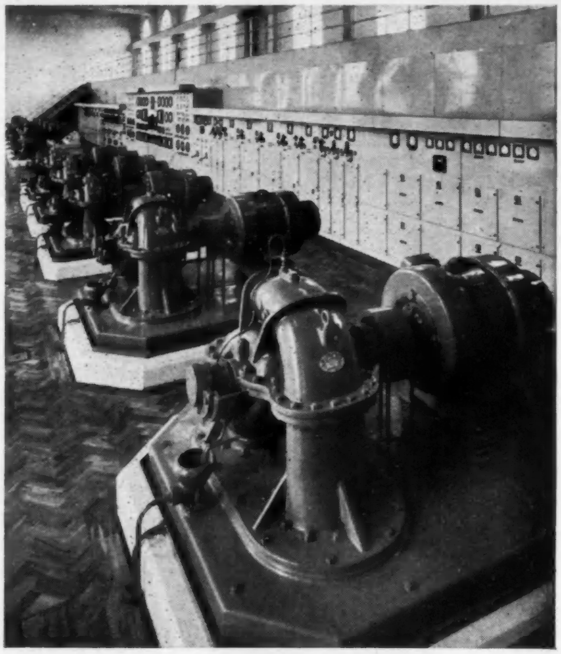
ALLEN

WATERWORKS EQUIPMENT

A complete installation of **DIESEL GENERATING PLANT** and **ELECTRICALLY-driven PUMPS** at the Pitsford Works of the Mid-Northamptonshire Water Board

The generating plant (above) comprises three 7-cylinder, 435-b.h.p., 600-r.p.m. Allen four-stroke, pressure-charged diesel engines driving 300-kW Allen alternators: the pumping plant (right) includes ten Allen single-stage, double-suction pumps of varying sizes and capacities, driven by Allen screen-protected, slip-ring motors — four 81-h.p., three 112-h.p. and three 140-h.p.

The total capacity of the ten pumping units is **45,000,000** gallons of water per day.



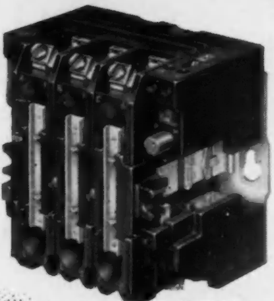
64 Allen pumping units have been installed for service in connection with the Pitsford waterworks scheme

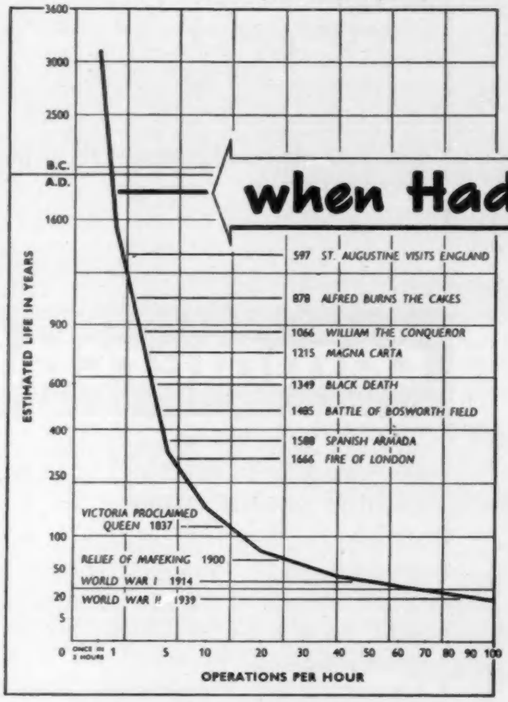
Engineer and Manager
L. H. Brown, Esq., B.Sc., M.I.C.E., M.I.W.E.

Specialists in complete Waterworks Pumping Plant installations

W. H. ALLEN SONS & C^O L^TD
BEDFORD ▪ ENGLAND

if this CRABTREE starter could have been installed





when Hadrian built his wall

GRAPH SHOWING TIME TAKEN IN YEARS RELATED TO 4,100,000 OPERATIONS PERFORMED BY CRABTREE TYPE B-15 CONTACTOR (BASED ON A 50-HOUR WEEK AND A 52-WEEK YEAR)

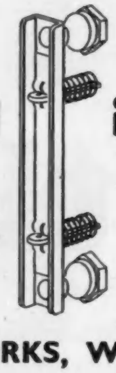
Tests are now proceeding in which Crabtree Type B-15 starters are being used for repeatedly stopping and starting motors. To date, the starters have given the following operations (start and stop) without change of contacts—

(*a*) Controlling a 5 h.p. motor: 4,500,000 operations;

(*b*) Controlling a 1 h.p. motor: 4,500,000 operations.

These tests are continuing.

The contacts would now need inspection



Type B-15 contacts, on actual motor-load life tests, have already achieved 4,500,000 operations (start and stop) and are still giving satisfactory service.

J. A. CRABTREE & CO. LTD., LINCOLN WORKS, WALSALL, STAFFS.

C 781

Introducing the **atlas**

a series of good quality low priced

single or twin tubes

tapped for all voltages

prepacked –

complete with Atlas White tube(s)

With sales already nearing the million mark, the Atlas Popular pack is vivid proof of the demand that exists for well-made low priced fluorescent fittings. Here to help you to cater for some of the more specialised industrial and commercial lighting needs are a series of good quality reflector and diffuser fittings, prepacked, complete with bi-pin tubes, for sales off-the-shelf at down to earth prices.

atlas

Atlas Lighting Limited
A subsidiary company of Thorn Electrical Industries Ltd.
233 Shaftesbury Avenue, London, W.C.2

industrial

ATLAS KB SERIES—POPULAR 5 ft. 80 w. INDUSTRIAL REFLECTOR FITTING

complete with chassis, open ended metal reflector, control gear and Atlas White Bi-pin tube. Metalwork stove enamelled white.

ATLAS KT SERIES—POPULAR 5 ft. 80 w. TROUGH FITTING

complete with chassis, one piece translucent opal 'Perspex' trough, gear and Atlas White Bi-pin tube.

commercial

ATLAS KA SERIES—POPULAR 5 ft. 80 w. ENCLOSED DIFFUSER FITTING

complete with chassis, reeded opal Perspex diffuser, end plates, gear and Atlas White Bi-pin tube.

ATLAS KO SERIES—POPULAR 5 ft. 80 w. COMMERCIAL FITTING

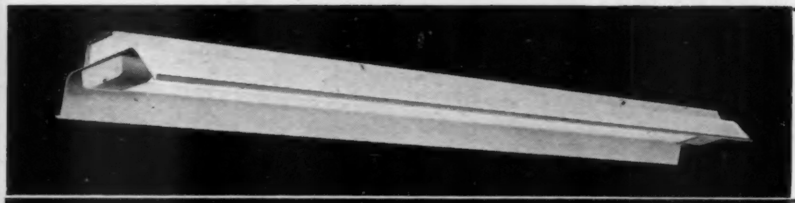
comprising chassis, 'Twin luve' pearl polystyrene diffuser, gear and Atlas White tube. Stove enamelled White. Complies with Ministry of Education requirements for school lighting.

battens

To the original series of 5ft., 4ft. and 2ft. packs is now added a 5ft. twin tube fitting. All fittings are supplied stove enamelled white, with clip-on plastic end caps, complete with glow-switch, universal gear and Atlas White Tube.

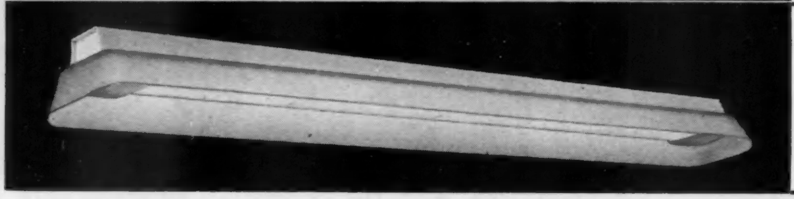
popular range

fluorescent lighting fittings



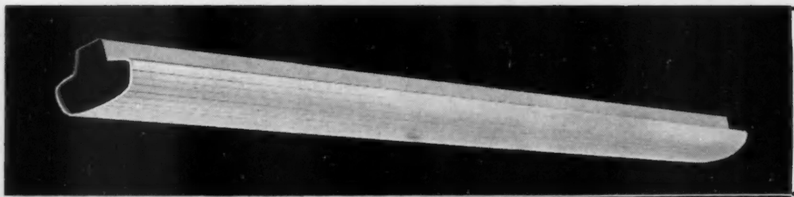
£7 · 12 · 0

Twin Tube version **£11·18·0**



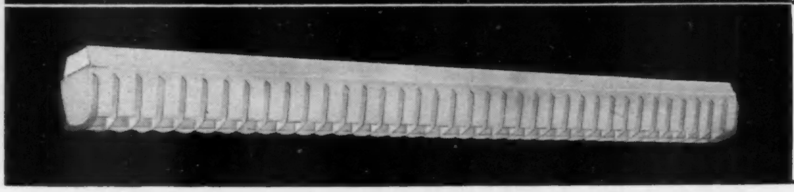
£10 · 1 · 8

Twin Tube version **£15·3·4**



£11 · 18 · 1

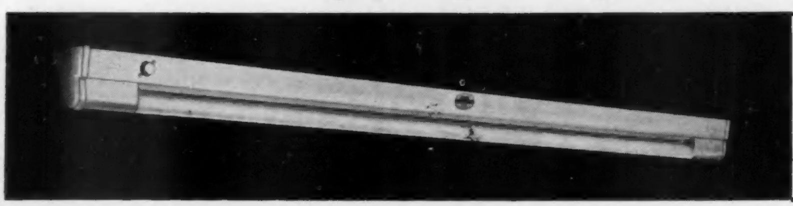
Twin Tube version **£16·9·4**



£13 · 5 · 5

Twin Tube version **£17·3·10**
4 ft. single **£10·15·4**
and 4 ft. twin **£13·15·7**

the original **Popular** *packs plus a twin tube version*



The original 5 ft. Popular Pack

£5 · 5 · 0

4 ft. Pack **£4·11·0**
2 ft, Pack **£3·10·0**
5 ft. Twin Tube version **£9·13·0**

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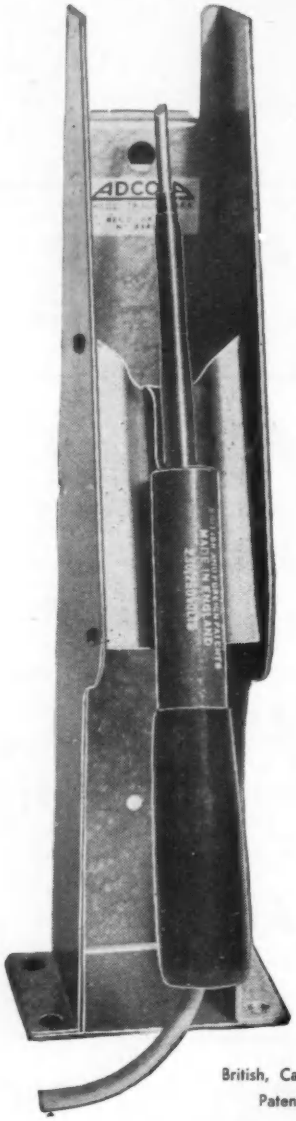
PRODUCTS LIMITED
(Regd. Trade Mark)

SOLDERING EQUIPMENT

SOLDERING INSTRUMENTS
P.V.C. & POLYTHENE CABLE STRIPPERS
SOLDER POTS, etc.



(illustrated)

$\frac{1}{8}$" DETACHABLE BIT TYPE

LIST No. 70

PROTECTIVE SHIELD

LIST No. 68

List No. 70 has been developed in particular for Solder jointing of Transistors.
It possesses the sharp heat necessary to make the joint in the minimum of time, thus avoiding damage to the transistor by heat transference.
As with all ADCOLA EQUIPMENT the elements for every volt range are fully insulated from earth.

The instruments with the correct soldering temperatures

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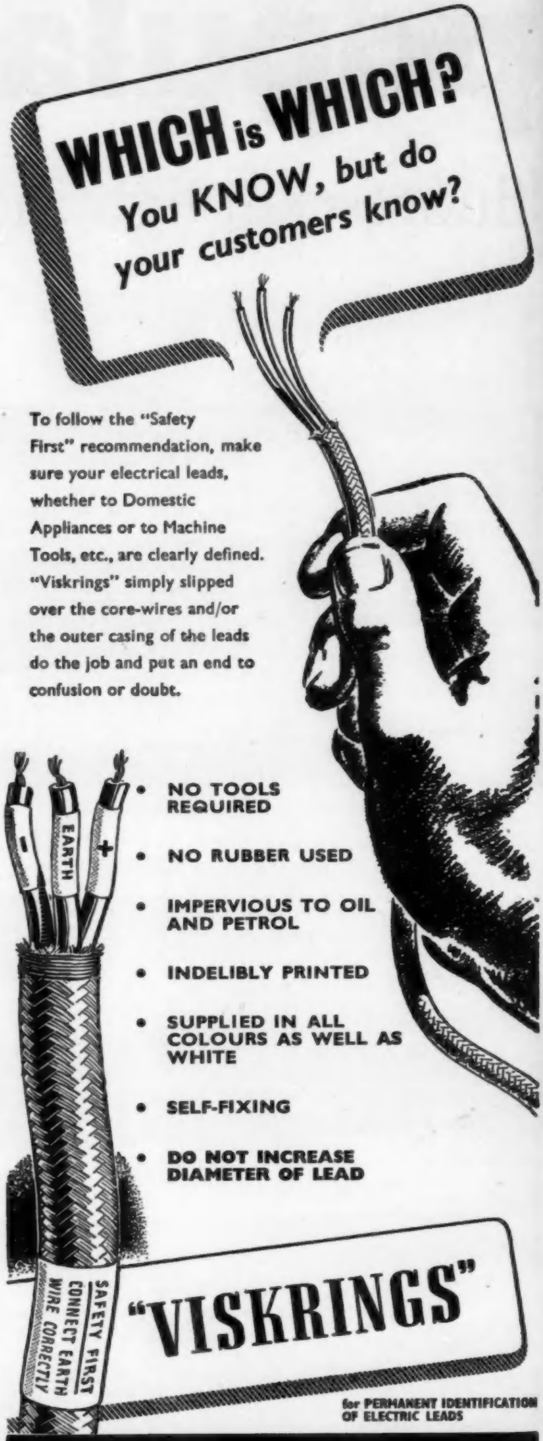
WHICH is WHICH?
You KNOW, but do your customers know?
EARTH
−
+
SAFETY FIRST
CONNECT EARTH WIRE CORRECTLY
"VISKRINGS"

To follow the "Safety First" recommendation, make sure your electrical leads, whether to Domestic Appliances or to Machine Tools, etc., are clearly defined. "Viskrings" simply slipped over the core-wires and/or the outer casing of the leads do the job and put an end to confusion or doubt.

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for PERMANENT IDENTIFICATION OF ELECTRIC LEADS

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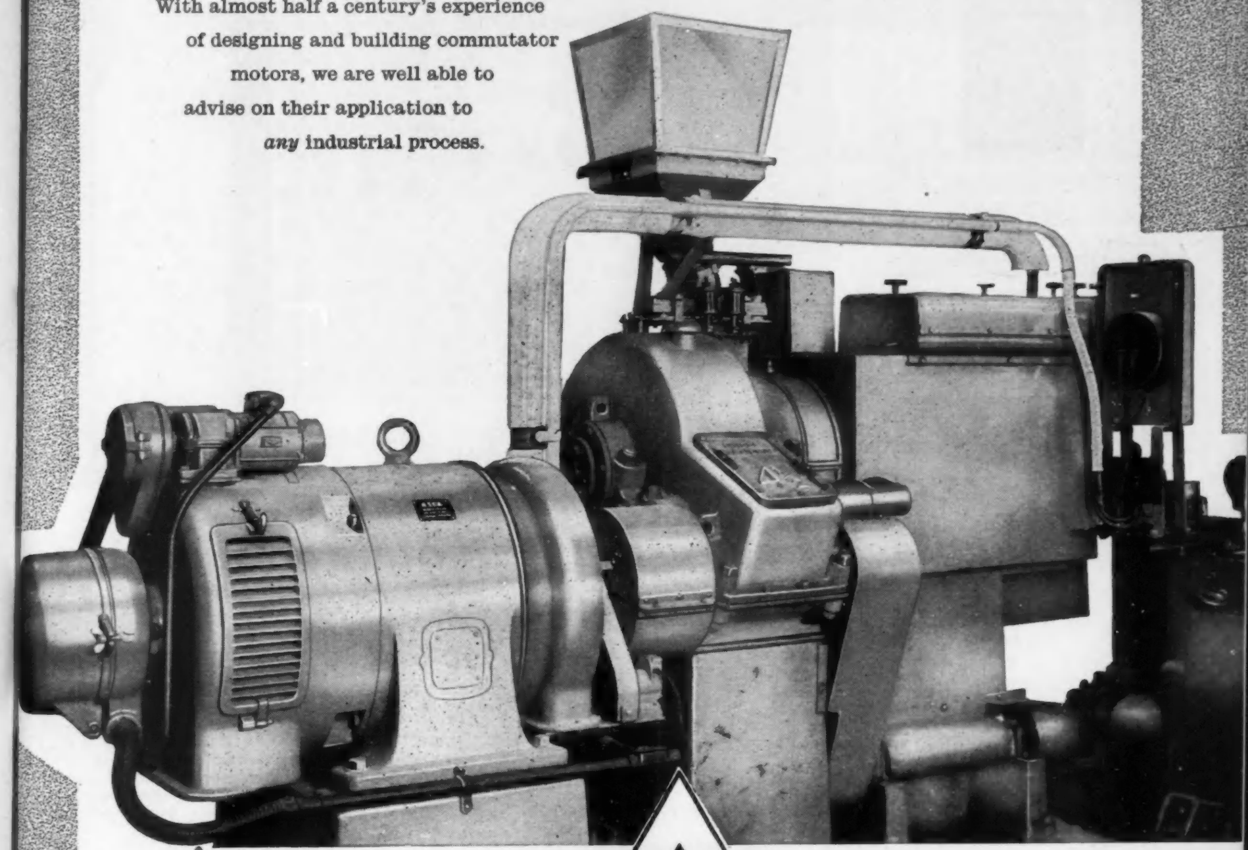
A. C. COMMUTATOR MOTORS . . .

for driving at EXACT speeds

In industries ranging from biscuit making to textiles, from steel fabrication to stocking manufacture, Fuller A.C. Commutator Motors are proving their worth.

With a commutator motor drive, a machine can be run at *exactly* its critical maximum speed, giving optimum output. Apart from increased productivity, a commutator motor also brings savings in power costs, paying for itself years before the end of its working life.

With almost half a century's experience of designing and building commutator motors, we are well able to advise on their application to *any* industrial process.



consult FULLER ELECTRIC

DIAMOND 1898-1958 JUBILEE

FULLER ELECTRIC LTD · FULBOURNE RD · LONDON E.17

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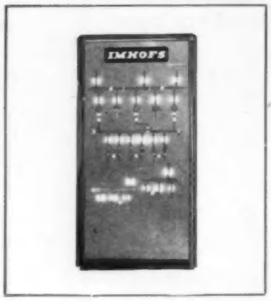
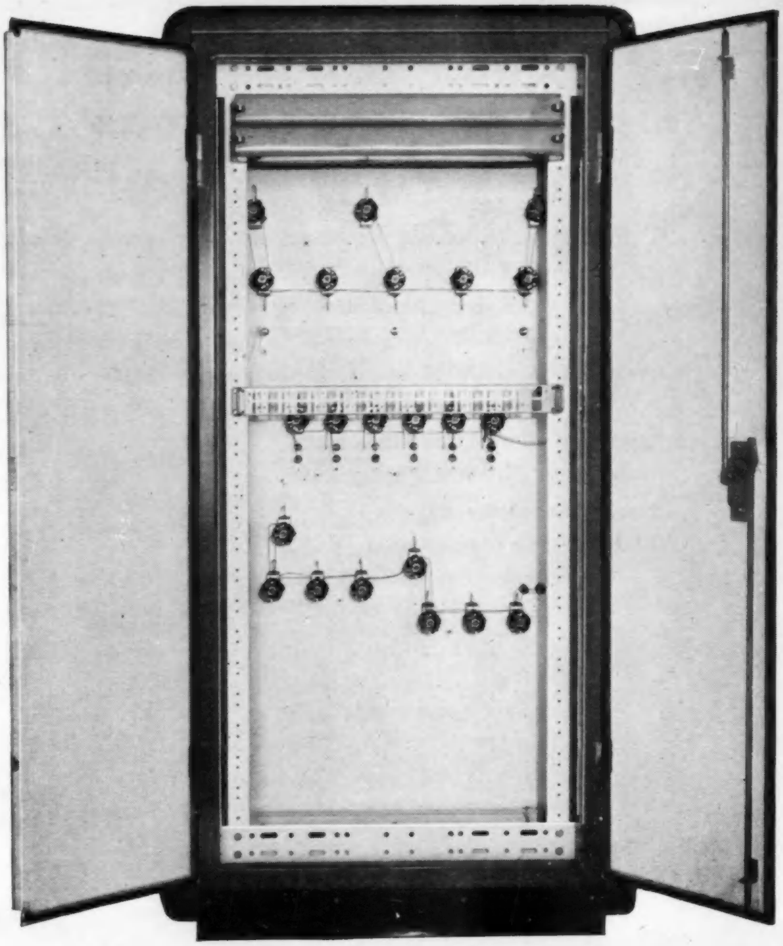


Typical example of an Imhof standard electrical cubicle fitted with control gear. Rear view shows partly assembled equipment in position. Imhof electrical cubicles enhance and protect the equipment they house and add much to the pleasantness of the operator's surroundings.



IMHOFS

standardised heavy-duty electrical cubicles

Two versions—*one for controls, one for apparatus* **Two standard sizes** *for each version* **Rigid, all-steel construction**

Reduce the cost of housing control gear or apparatus with Imhof *standardised* electrical cubicles. After intensive research into the needs of the electrical industry, Imhofs have designed these strong, attractive cubicles to an exacting specification which will meet most engineers' requirements. Available in single or bayed-up multiple units, they are a worthy addition to the already famous Imhof standard range of instrument cases, racks and consoles. Fully descriptive literature on request : just phone, or write on your Company's letterhead.

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3-WAY ADJUSTABLE INTERNAL FRAMEWORKS for mounting equipment.

DOUBLE-SKINNED REAR DOORS fitted to both versions ... fully gasketed and mounted on robust lift-off hinges. Positive 3-point lever-type lock ensures safe sealing. Similar doors fitted to fronts of apparatus cubicles. Control cubicles have formed 10swg front panels.

WIDE CHOICE OF FINISHES AND OPTIONAL EXTRAS Standard finishes: silver, light and dark grey hammertone, or high-gloss grey. Chrome-plated handles and hinges. Two-colour finishes to order. Front panels, with mimic diagrams, punched and drilled to individual requirements. Internal strip lighting, including switches and wiring, also supplied.

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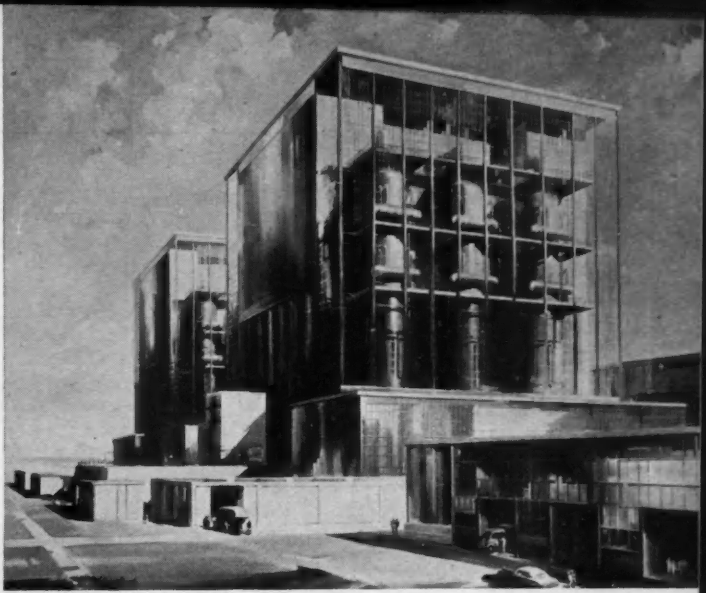
BELGIUM Rogelec, Ghent
CANADA Measurement Engineering Ltd, Arnprior
DENMARK Tage Schouboe, Copenhagen N
FINLAND Oy Scienta Ab, Helsinki
HOLLAND J.Th. van Reijsen, Delft
ITALY Prodel SPA, Milan
NEW ZEALAND Imarex Ltd, Auckland C3
NORWAY Birger Christensen, Oslo
SWEDEN Elektronlund AB, Malmo C
SWITZERLAND Walter Blum, Zurich 2/39
U.S.A. Bud Radio Inc, Cleveland 3, Ohio
BRIT. GUIANA British Caribbean Agencies Ltd, Georgetown, Demerara



REMEMBER POPPY DAY

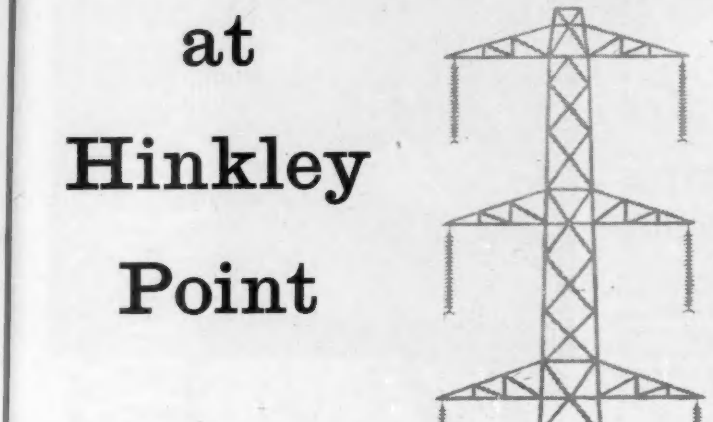
POWER

at Hinkley Point

BICC are supplying all the power and control cables, and large quantities of ancillary equipment for this new atomic power station. The installations are to be carried out by the BIC Construction Company.

With an output of 500 megawatts Hinkley Point will be the world's largest atomic station. It is being built for the C.E.G.B. by the English Electric — Babcock & Wilcox — Taylor Woodrow consortium.

The BIC Construction Company have also been awarded the contract to supply and erect approximately 50 miles of 275kV overhead line for the National Supergrid between Hinkley Point and Melksham, Wiltshire.



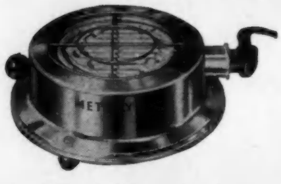
BICC

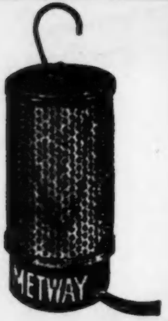
transmission equipment

BRITISH INSULATED CALLENDER'S CABLES LIMITED

21 BLOOMSBURY STREET, LONDON, W.C.1

METWAY

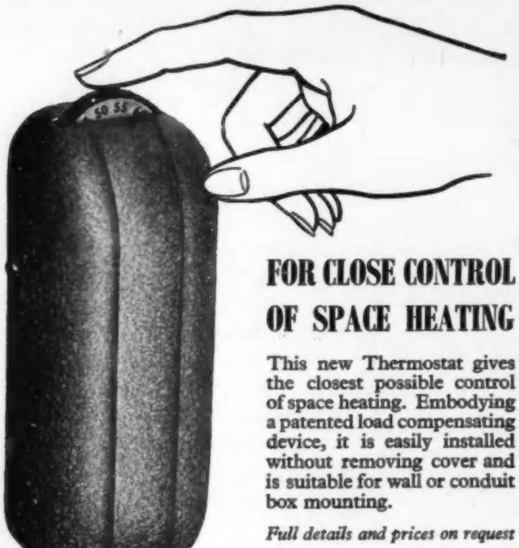




"SUPERWAY" BOWL FIRE 18/6 plus 3/3 P.T.
"DANDYWAY" BOILING RING 19/8 No P.T.
"MIDGETWAY" ELECTRIC KETTLE 30/3 plus 6/6 P.T.
"FROSTAWAY" HEATER 11/11 plus 2/7 P.T.

ASK FOR OUR NEW APPLIANCES CAT. NO. DAR/10ER

METWAY WORKS · KEMPTOWN · BRIGHTON



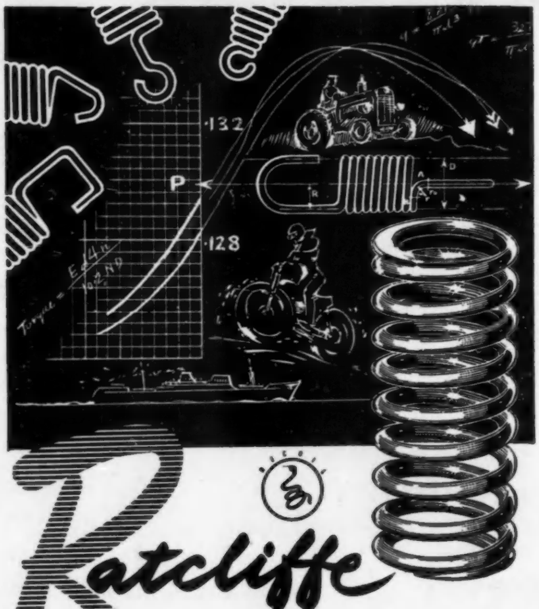
FOR CLOSE CONTROL OF SPACE HEATING

This new Thermostat gives the closest possible control of space heating. Embodying a patented load compensating device, it is easily installed without removing cover and is suitable for wall or conduit box mounting.

Full details and prices on request

'*Constat*' MODEL PF CONTROLLERS

THE THERMOSTATIC CONTROLS CO.
AVENUE RD., HAMPTON, MIDDX. Tel.: Molesey 3285/7



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F. S. RATCLIFFE (Rochdale) LTD.
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Gravity and Pressure Diecastings
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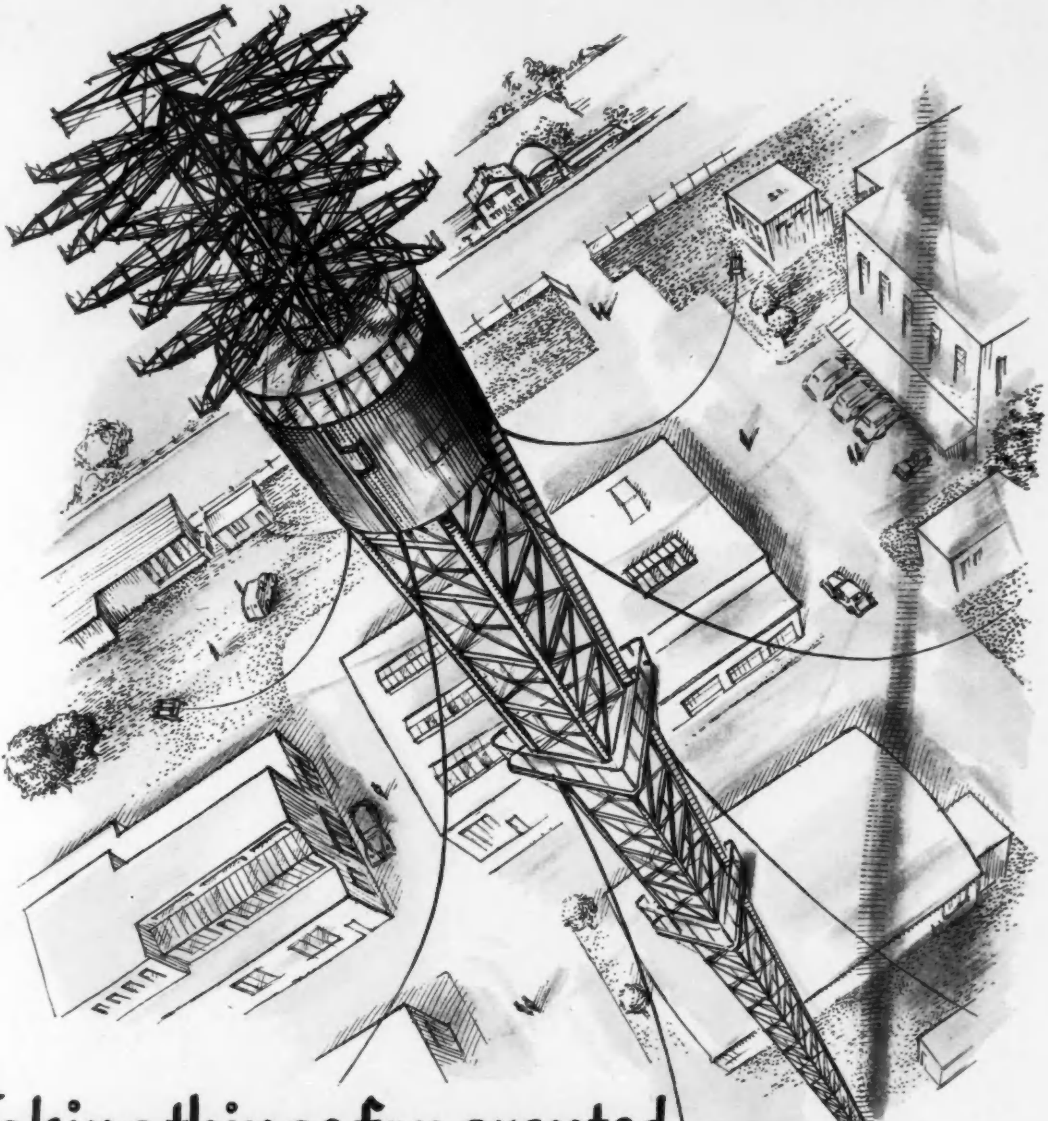
QUALITY and DISTINCTION
In Aluminium and Zinc Base Alloys



Taking things for granted

Television Masts, whether we like it or not, are accepted as part of the landscape. Television screens throughout the country rely on them for signals. Not so conspicuous, but nevertheless playing their part, Rist's Cables are another of the many things taken for granted.

RIST'S

RIST'S WIRES & CABLES LTD

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Sole London Distributors: LYMELITE ELECTRICAL INDUSTRIES LTD

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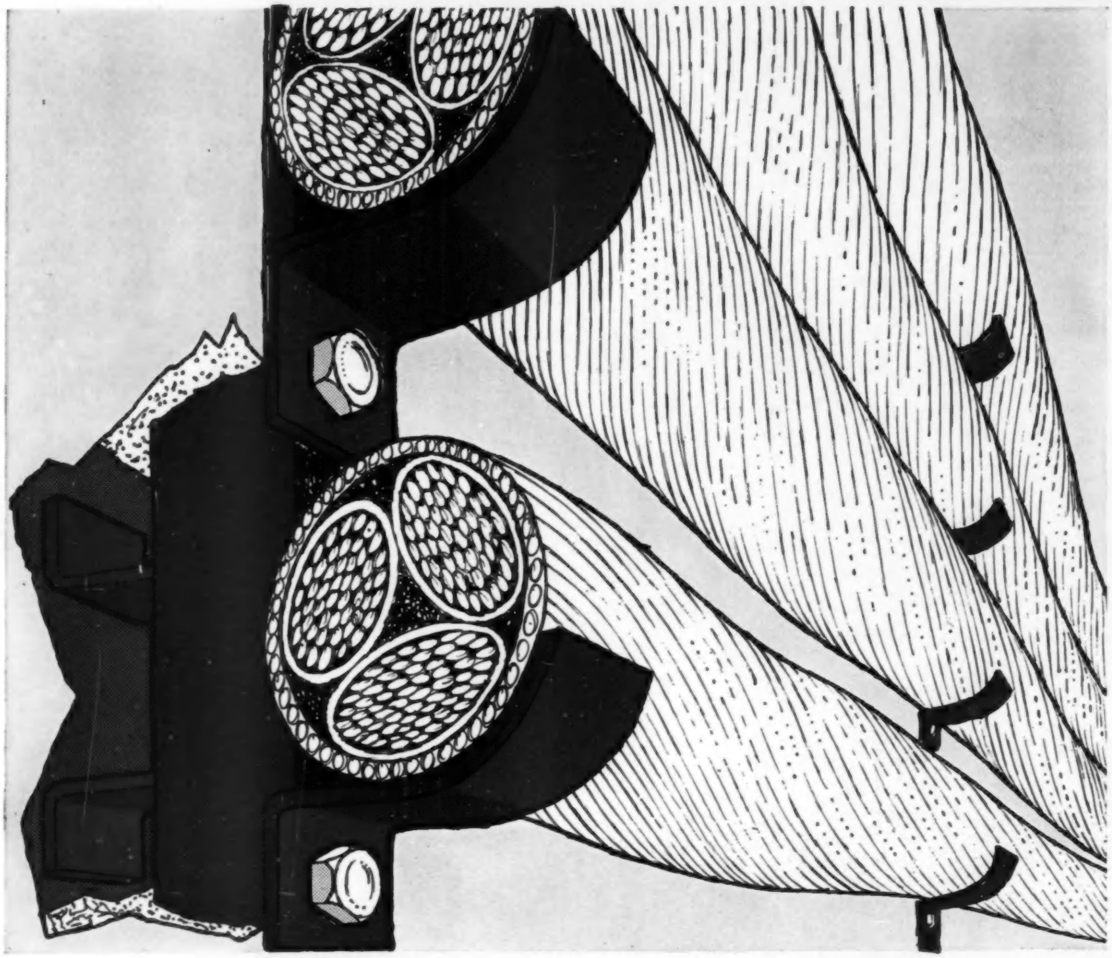
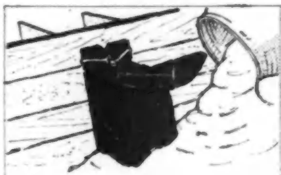
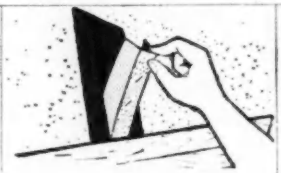


STEADY AS A ROCK —ADJUSTABLE AT WILL

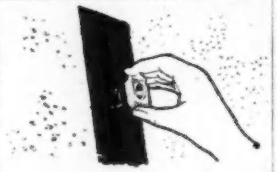
Unistrut concrete inserts permit rapid completion of heavy piping and electrical installations. Large savings are evident both at the planning stage and in actual on-site costs. Easy access for maintenance, or for additions to the installation, provides further economies in service. Please write for illustrated details.



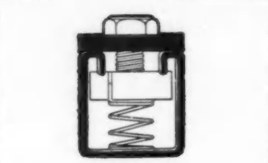
Unistrut concrete insert lightly fixed to shuttering. When concrete is poured, the special anchors at the back of the channel make it an integral part of the structure.



Unistrut fittings can be attached as soon as the shuttering is struck. Cardboard closer strip, protecting inside of channel from stray concrete, is easily removed.



Inserting self-locating Unistrut nuts by which fittings are quickly and securely attached at *any* point of the insert.



Section through a complete assembly shows its *box-section* strength. Serrated grooves in the nut grip the channel edges firmly.

UNISTRUT
Division of SANKEY-SHELDON Ltd.

Unistrut concrete inserts another feature of the Unistrut Steel Channel Framing System — for piping, racking, electrical installation and all framing applications.

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London Office: 46 Cannon Street, London, E.C.4.
Telephone: City 4477 Telegrams: Sankeshel, Cannon-London.

UNI 10727

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and don't forget WOOTTON wood blocks, sunk switch boxes and instrument cases.

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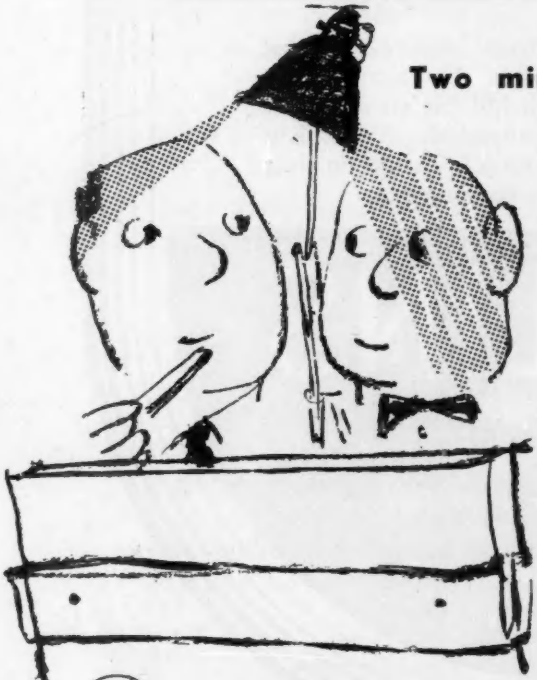

Two minds with but a single thought!

L.E.F. Raising and Lowering Gear for inaccessible lights!

It's the brightest thought architects and electrical contractors can have when faced with the tricky problem of installing an interior lighting system in which the fittings are out of reach yet must be serviced.

The whole beauty of incorporating L E.F. raising and lowering gear lies in the fact that maintenance staff can so quickly bring the lighting fittings down to ground level for ease of servicing.

If you have a lighting problem, then call in London Electric Firm at the planning stage in order to get your technical requirements ironed out and to ensure suitable delivery.

LEF LONDON ELECTRIC FIRM LTD.
Brighton Road, South Croydon, Surrey Telephone: Uplands 4871

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R.Ll. 1
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COLLINS ELECTRICAL LTD.
115, CLERKENWELL ROAD
LONDON.
B.O.A.C.
115 CLERK
SNWELL ROAD
LONDON

Flying Repairs. Repairs from overseas are not infrequent at the house of Collins. The above photograph shows two rotors, which had just arrived by air from the Middle East, being unpacked. A few days later they were again in B.O.A.C.'s charge on their urgent way back to another satisfied customer.

COLLINS

Collins Electrical Ltd.
Head Office 115 Clerkenwell Road London E C 1
Central London Works
22 St. Albans Place Upper Street Islington N 1
West London Works
9 & 11 Featherstone Road Southall
Phone Holborn 0212-4 Canonbury 3227-8
or Southall 0168

There is safety in **these** numbers . . .

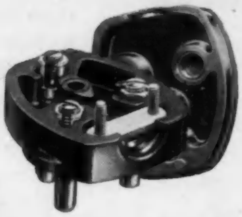
TEMCO WIRING ACCESSORIES

have many refinements that put them in a class by themselves. They are DESIGNED to make it easier for the men who do the wiring and anything that is done more easily is done more quickly. They are DESIGNED for higher efficiency and greater reliability. For instance, the decisive, snap acting A.C. switch action makes it impossible to draw a continuous arc by misuse. Glance at the switch-socket illustrations on this page and notice the recessed dolly. A small point, yes, but typical of the care and attention given to every detail both in design and manufacture. TEMCO are better throughout.

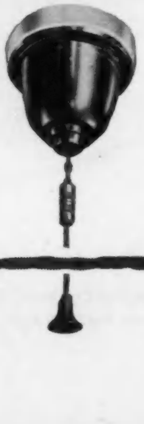
These Accessories are also available in cream. Please write for catalogue showing complete range.

CAT. NO 4005 BROWN

CAT. NO. 4009 BROWN



CAT. NO. 4090 BROWN



CAT. NO. 8000 BROWN ON WHITE

RIGHT AT EVERY POINT

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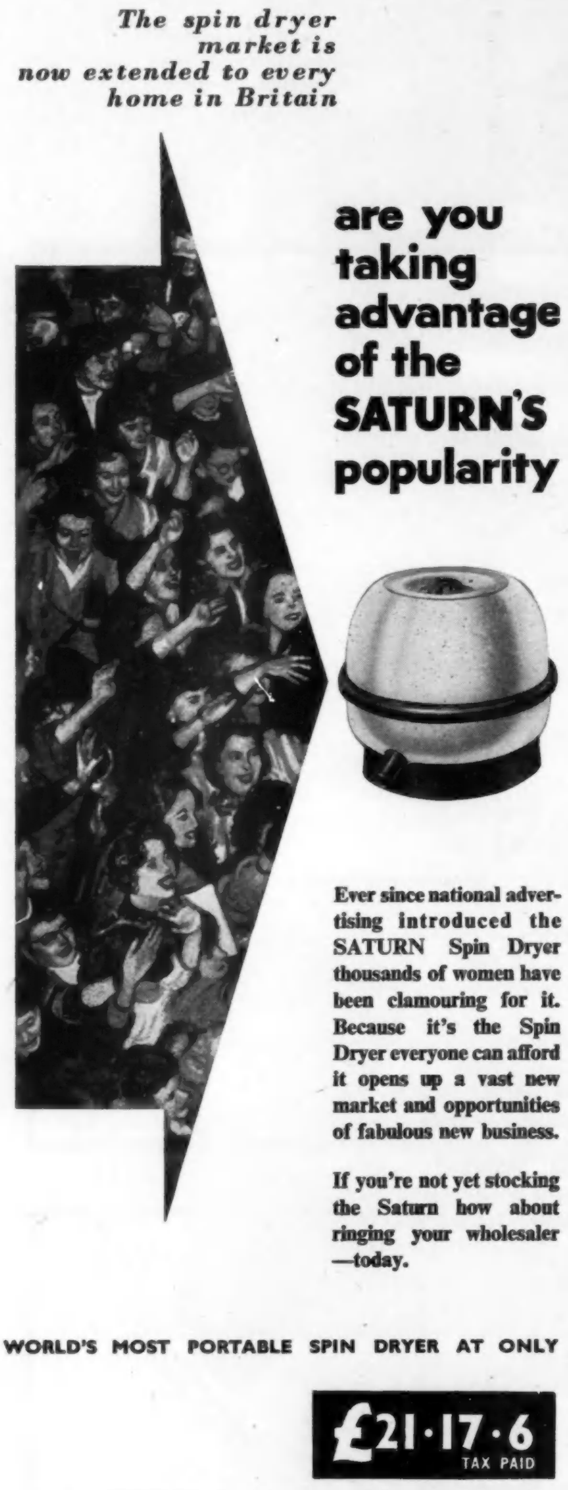
Tel: PADdington 1867/8/9.



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are you taking advantage of the SATURN'S popularity

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Because every tooth on a 'Shakeproof' washer acts as a strut, preventing the screw or nut backing off. Every tapered, twisted tooth creates powerful spring tension between work surfaces, tension that ensures the lock is secure, tight. The sharp edges of each tooth anchor firmly, without milling. The greater the vibration — the stronger the lock. You can't find a more powerful lock than 'Shakeproof' Lock Washers, available in a wide range of sizes and types.

'Shakeproof' lock washers are available in tempered & hardened high carbon spring steel, or phosphor bronze.

A.I.D. APPROVED

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Nobby Distributors Ltd., 438 Harrow Road, London, W.9.
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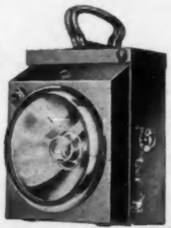
584

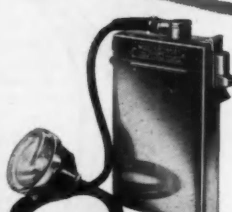
Buy NIFE Lamps now for years of light

NIFE PORTABLE LAMPS are powered by all-steel alkaline batteries which won't corrode or self-discharge. You can leave a Nife lamp standing idle for months or even years—and it will work the first time you touch the switch. Nife lamps are lighting the way for public works engineers, railway engineers, fire brigades, civil engineers, oil companies and hospitals . . . down mines, aboard ship and in every branch of industry.

NIFE SEARCHLIGHT S6

Gives 3 hours' light on 3.0 amp. main filament or 20 hours on reserve filament. The beam of light equals that of a motor car headlamp. Approved by the Ministry of Fuel & Power.



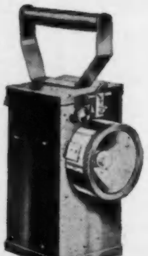


NIFE HEADLAMP NC113C

Gives 10 hours' light on main high efficiency 1.0 amp. Krypton gas-filled bulb. Fitted with pilot bulb for emergency. Approved by the Ministry of Fuel & Power and Ministry of Transport.

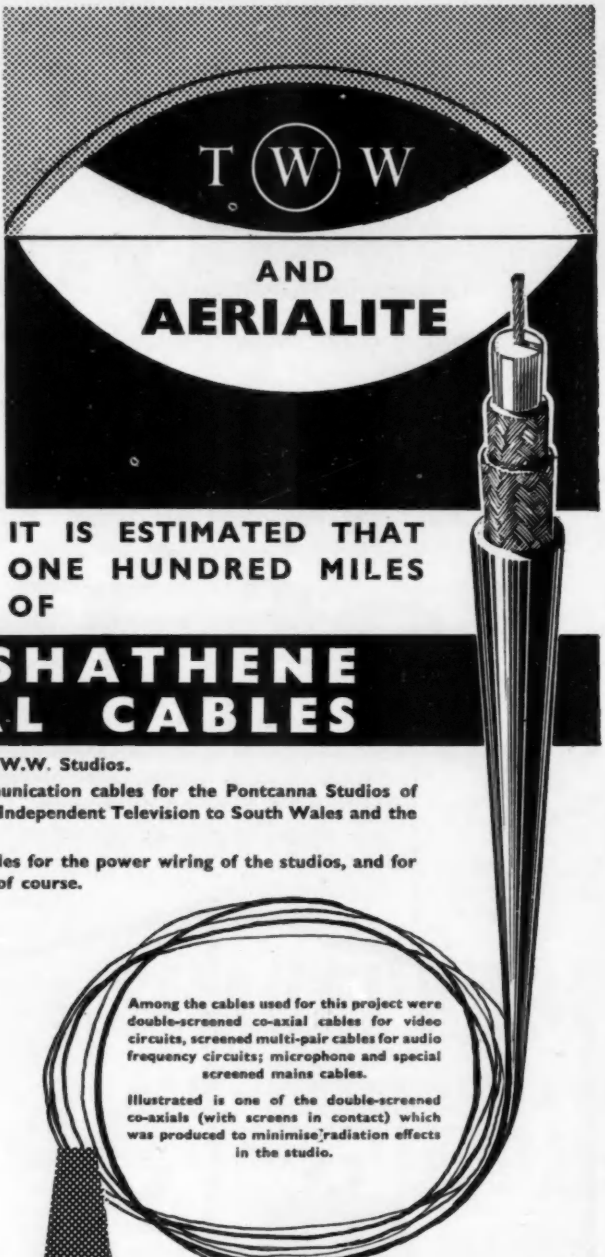
NIFE HANDLAMP NH10A

Sturdy all-purpose inspection lamp weighing only 4 lb. Gives approximately 10 hours' light per charge. Approved by the Ministry of Fuel & Power and Ministry of Transport.



* **ILLUSTRATED LEAFLETS** about these and other Nife lamps will be gladly sent on request to: Nife Batteries, Redditch, Worcestershire.

NIFE *batteries won't corrode* N.120



IT IS ESTIMATED THAT ONE HUNDRED MILES OF

ASHTON, ASHATHENE & AERAXIAL CABLES

were installed at the T.W.W. Studios.

Aerialite supplied power, signalling, control and communication cables for the Pontcanna Studios of T.W.W. Limited and thus materially assisted in bringing Independent Television to South Wales and the West of England.

T.W.W. installed Aerialite rubber and thermoplastic cables for the power wiring of the studios, and for studio equipment used Aeraxial high-frequency cables, of course.

Among the cables used for this project were double-screened co-axial cables for video circuits, screened multi-pair cables for audio frequency circuits; microphone and special screened mains cables.

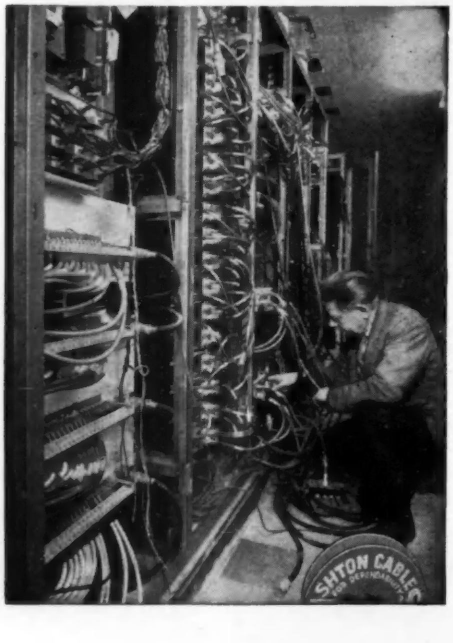
Illustrated is one of the double-screened co-axials (with screens in contact) which was produced to minimise radiation effects in the studio.

Aerialite LTD

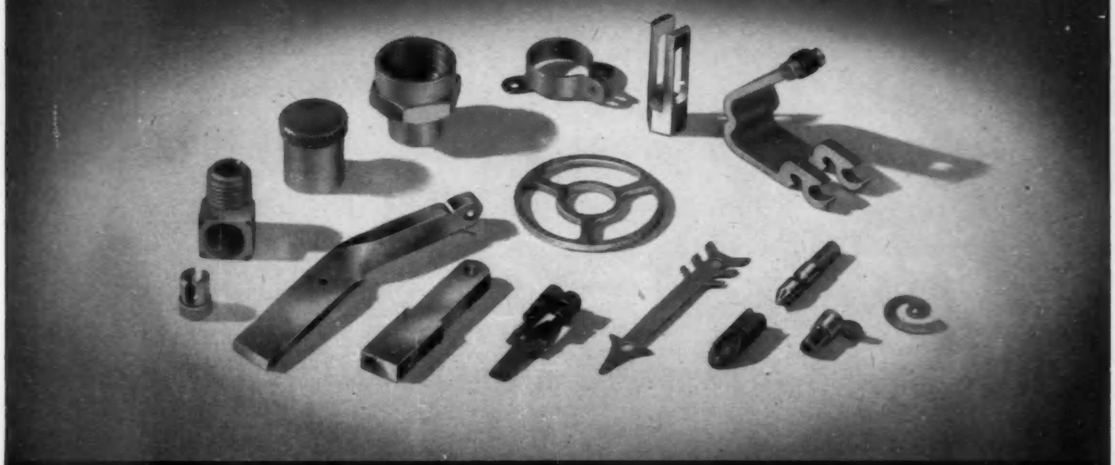
If you are interested in power or radio-frequency cables, contact :

AERIALITE LTD., Head Office and Cable Division
CASTLE WORKS, STALYBRIDGE, CHESHIRE
Aerial and Electronics Division
HARGREAVES WORKS, CONGLETON, CHESHIRE

C.W. 5212



METAL PARTS



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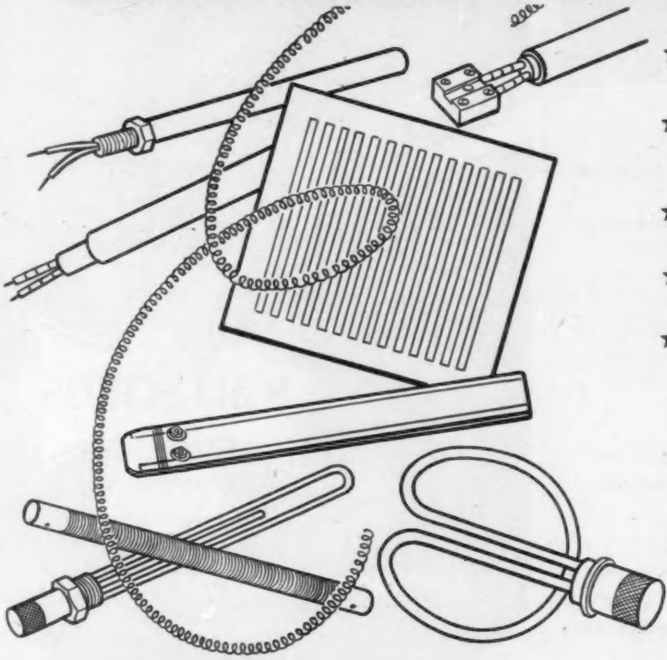

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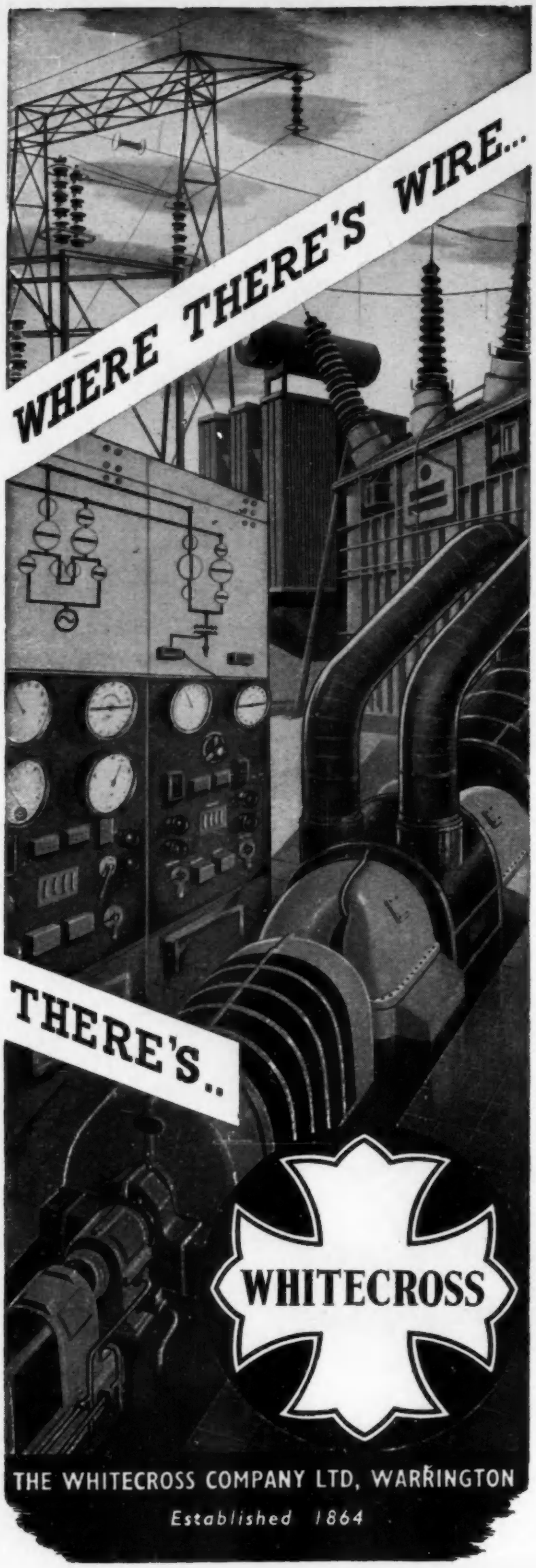
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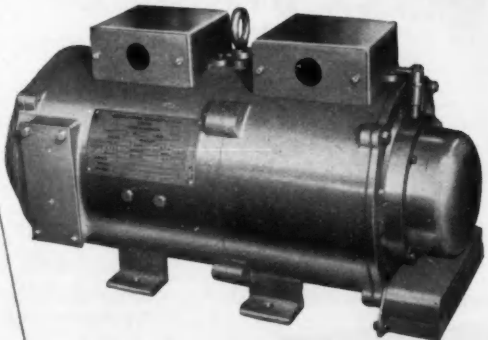

A typical E.D.C.C. 400 c.p.s.
motor alternator
of unit construction.

Bristol Aero Engines Ltd. have selected E.D.C.C. High Frequency Motor Alternators for the test sets used on the 'Proteus' turbo prop engines which power the 'Britannia'. These M/A Sets are used extensively on projects which include industrial electronic equipment, radar and marine applications, high frequency induction heating, test and research equipment.

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P.1384

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❶ Transistorised for high conversion efficiency.

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❸ Easy one-hand operation.

❹ Clear-reading protected dial.

❺ Moulded front panel set in a fibre-glass case.

❻ 500-volt insulation and continuity tests combined in a single instrument.

❼ Practically ripple-free—only 0.1% ripple.

❽ Long battery-life.

❾ Good design and quantity production combine to keep the price low.

PRICE: *complete with detachable polythene front cover, leather sling strap and 5' test leads fitted with crocodile prod clips* .... **£21.12.0d.**

250 and 100 volt models also available.

For fuller technical description and applications write for Sheet 242 A.

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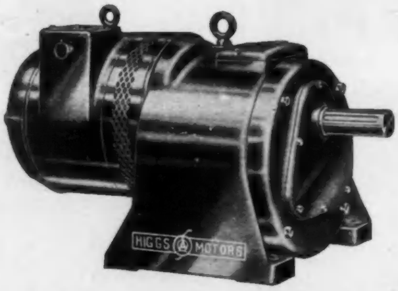

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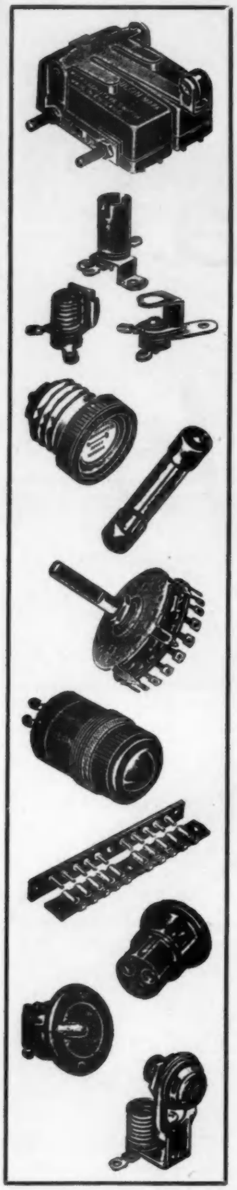
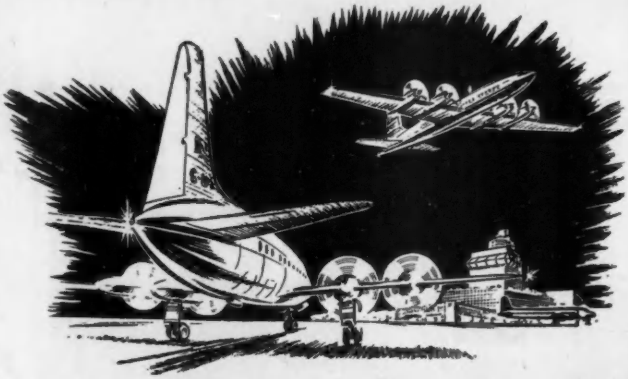


SPEED...



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Type T~~Y~~C

TYX/B

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The type TYX/B 'Simmerstat' has many advantages: it is only one-third of the size of the TYC, the control knob rotates either way with definite dwells at "OFF" and "FULL" and it is rated at 15 amps. **Yet it is still lower in price!**

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Full details from

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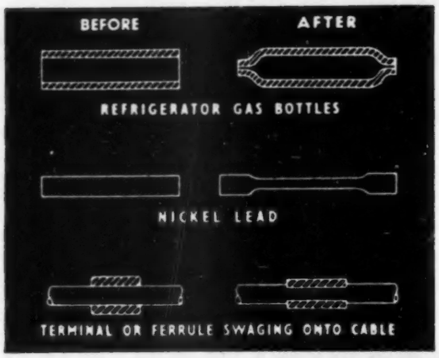
It is a means of reducing or pointing tube and rod by a hammering process

Reducing powder filled steel inconnel and copper elements Tungsten and Molybdenum wire for filaments. Necking refrigerator gas bottles.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AFTER
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TIME, MATERIAL AND MONEY IS SAVED

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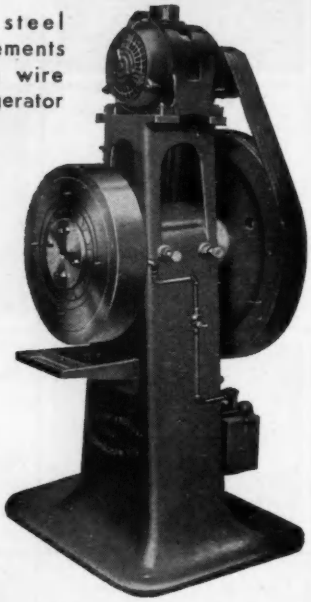

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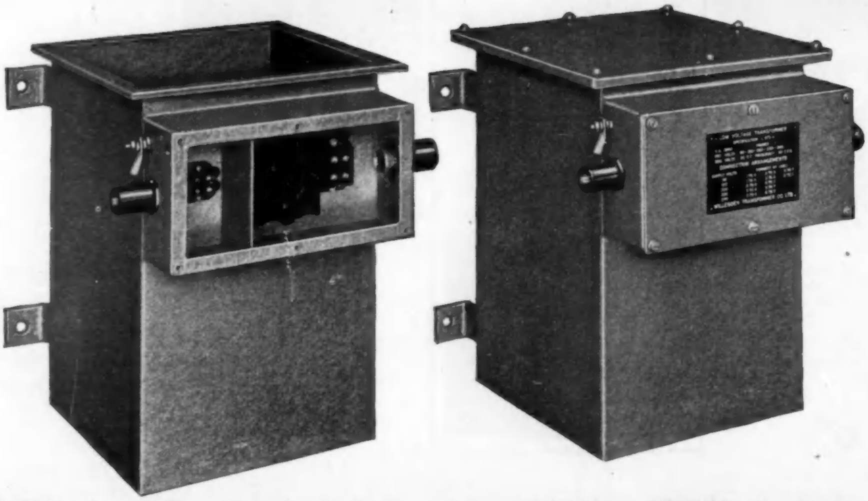

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That was when the Spencer stage ran
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Our nags collapsed with fright.
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Dissolved into the night.
A thousand deaths we must have died—
The villain watched us quiver.
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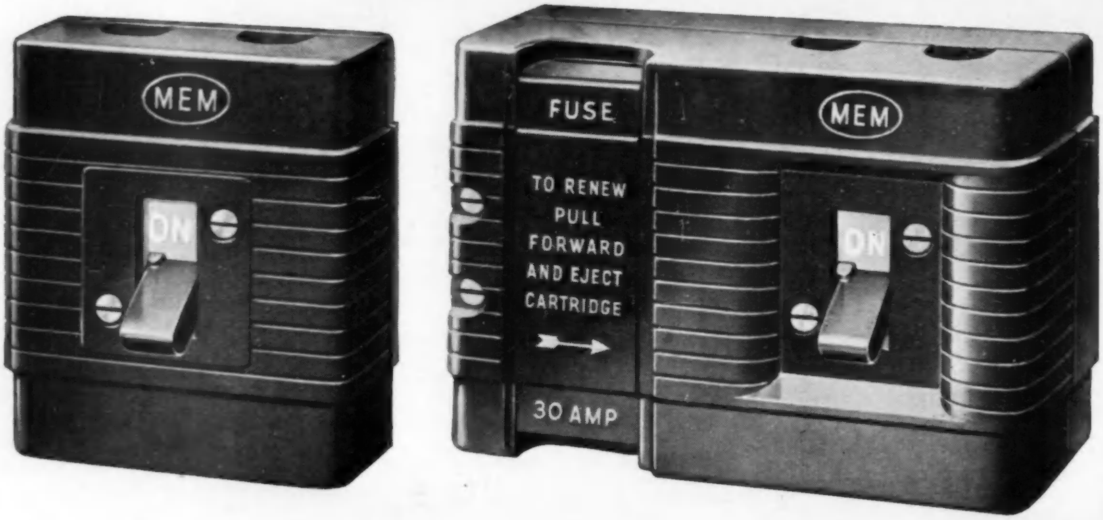

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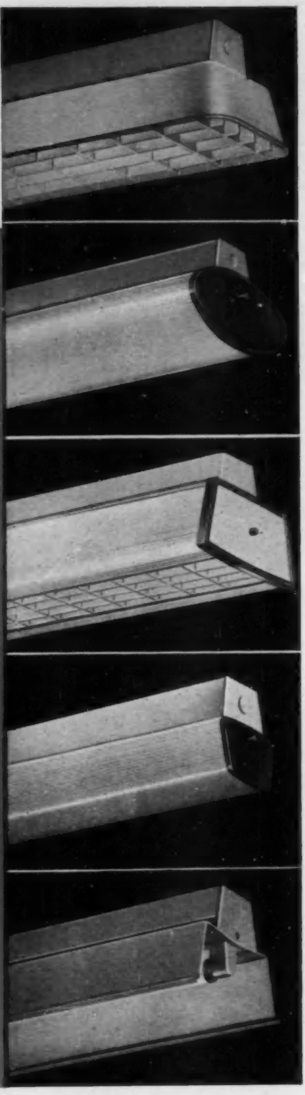

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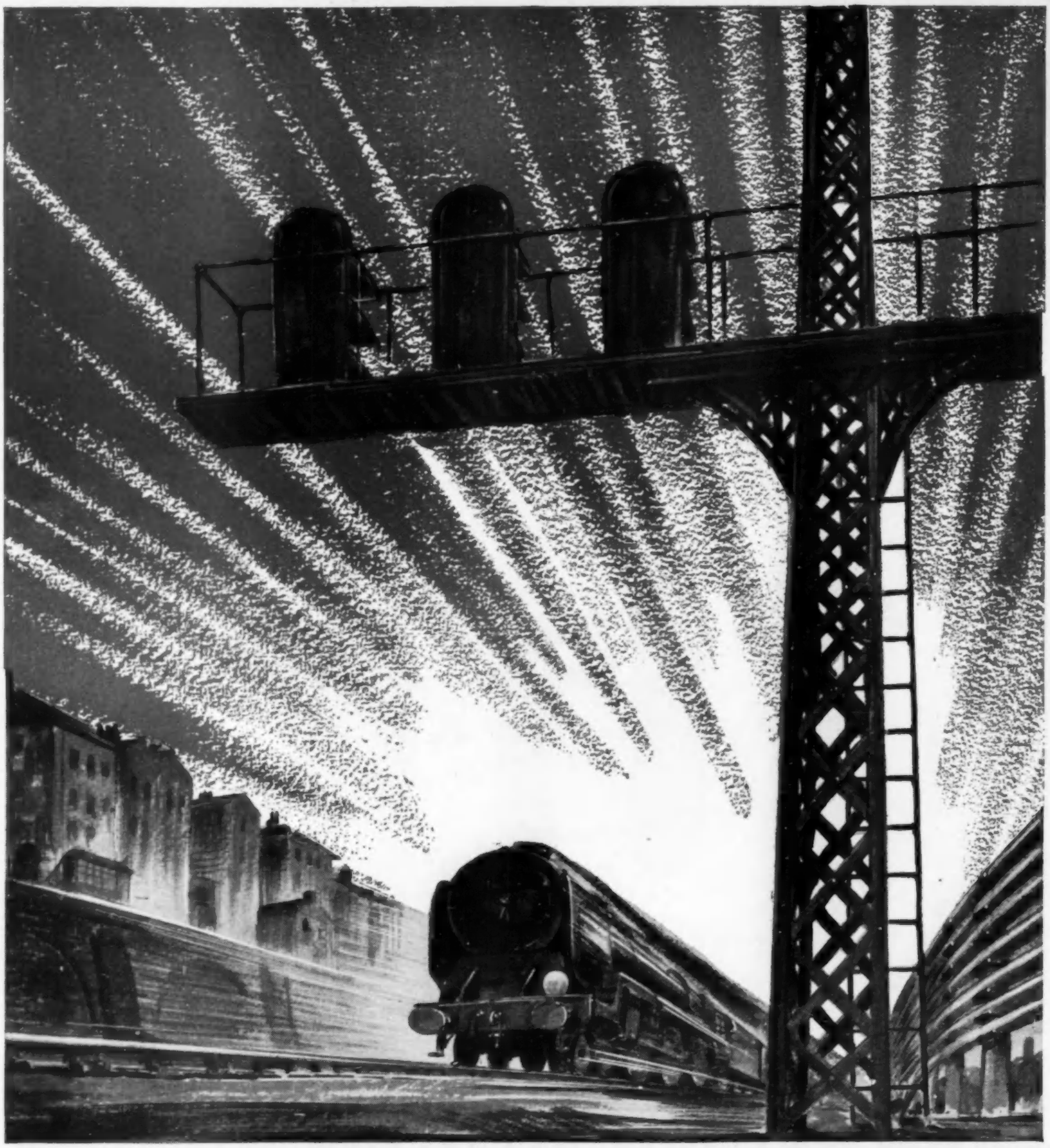

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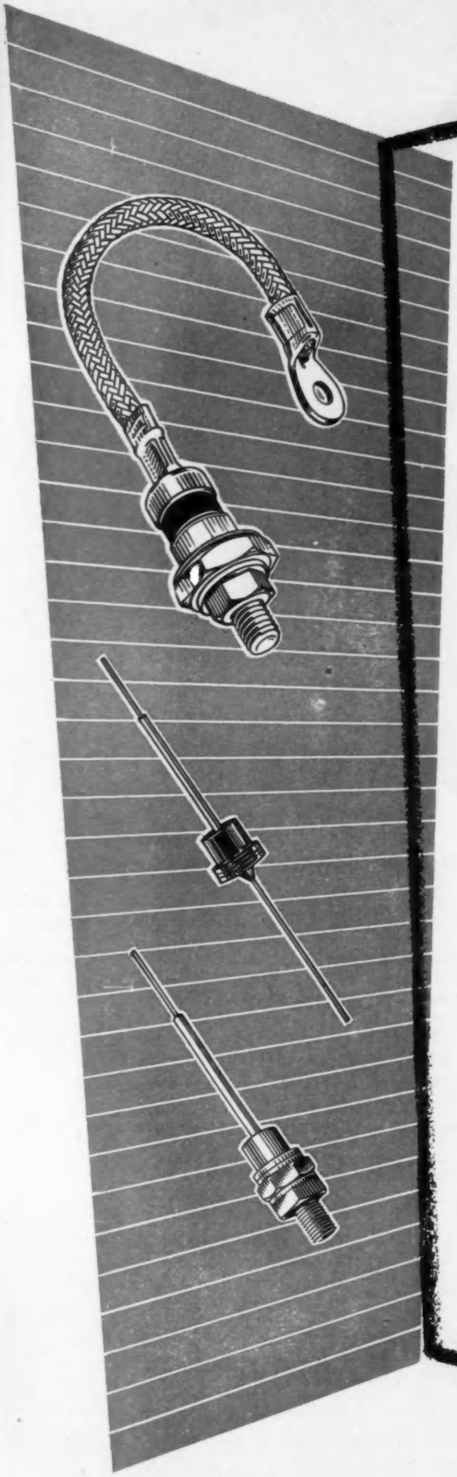

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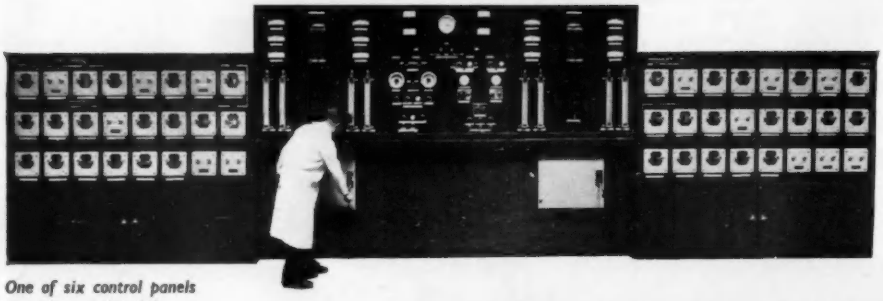

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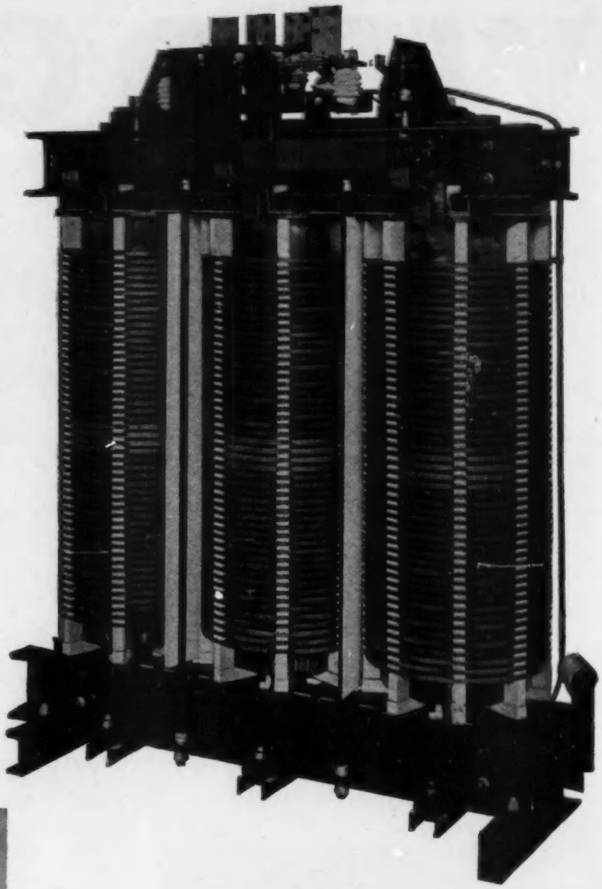

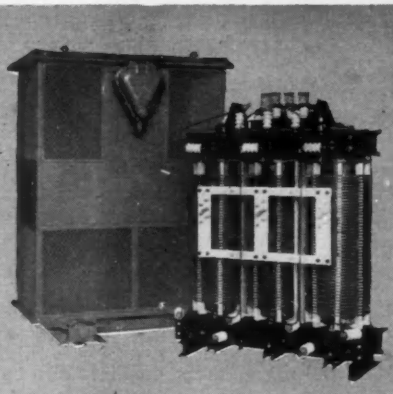

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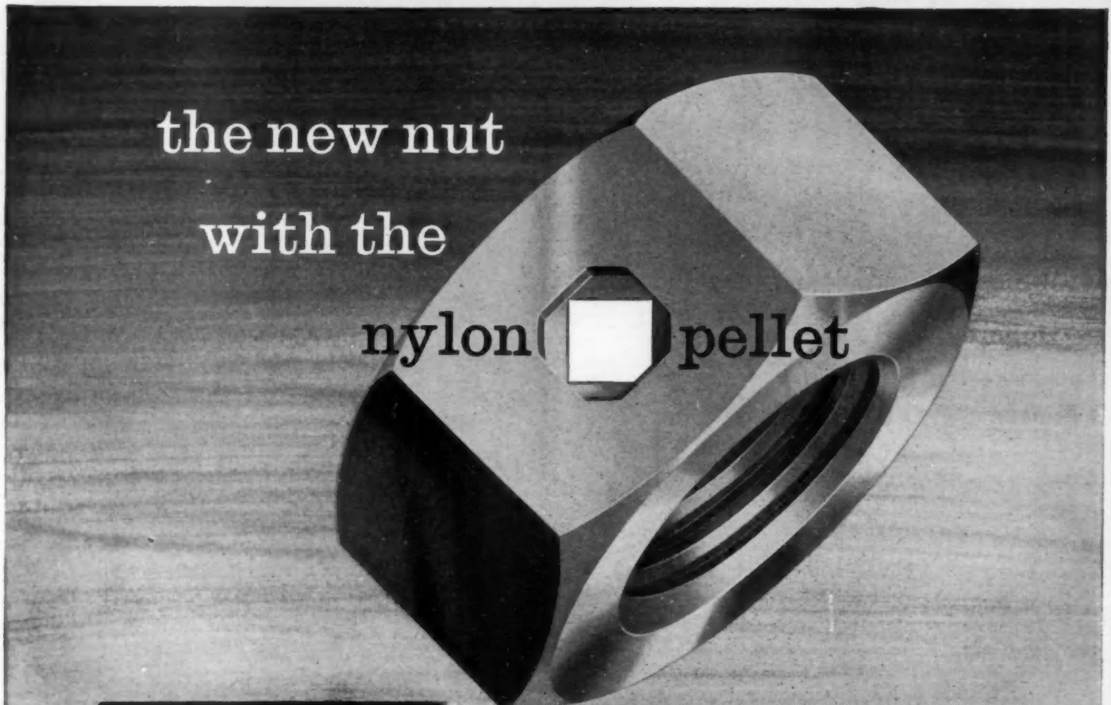

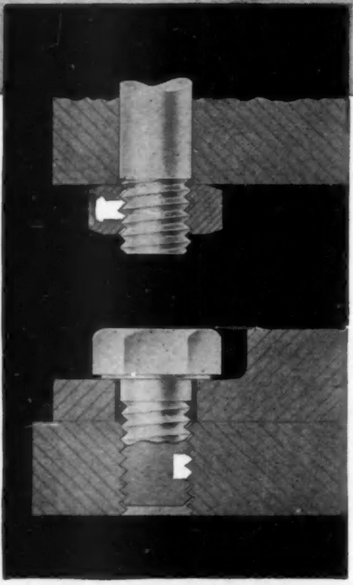

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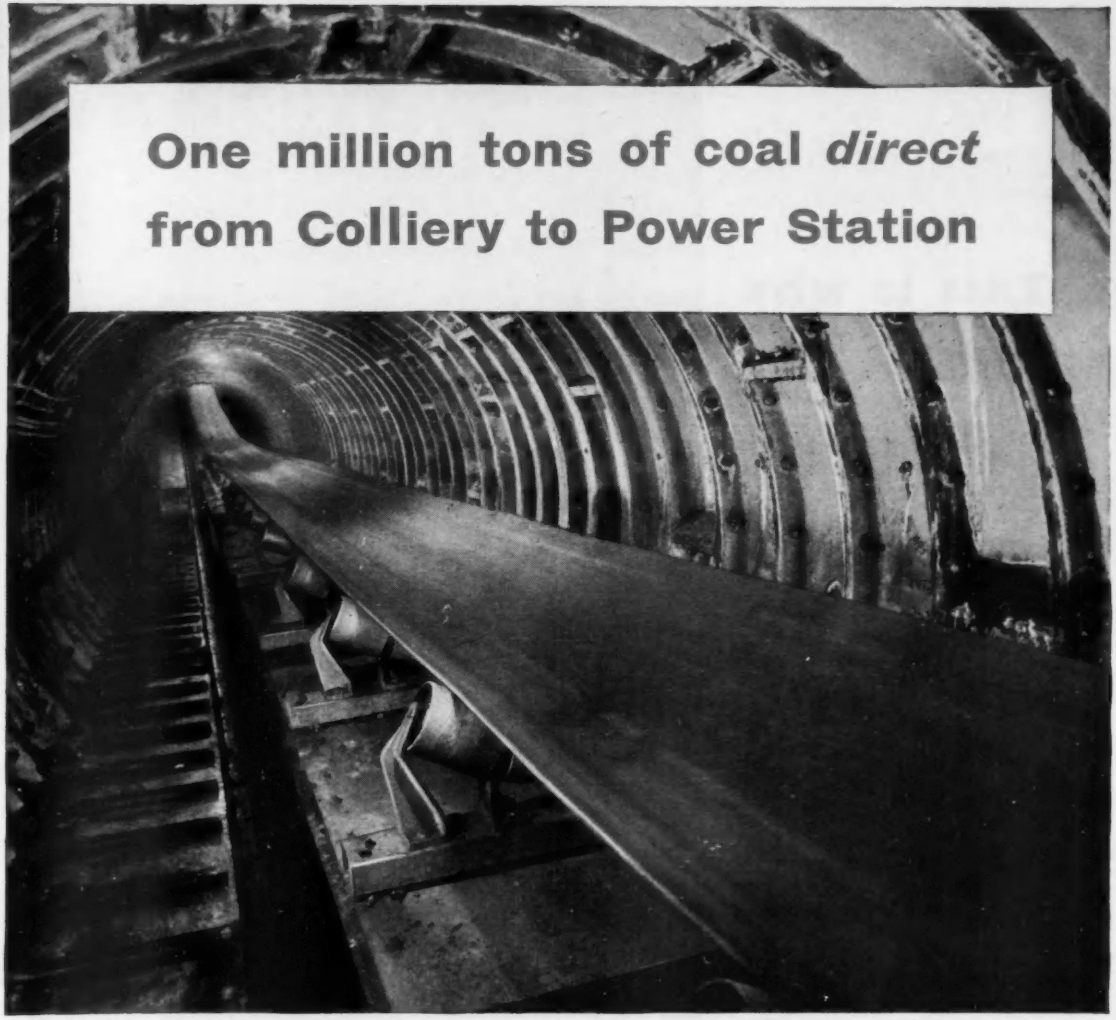

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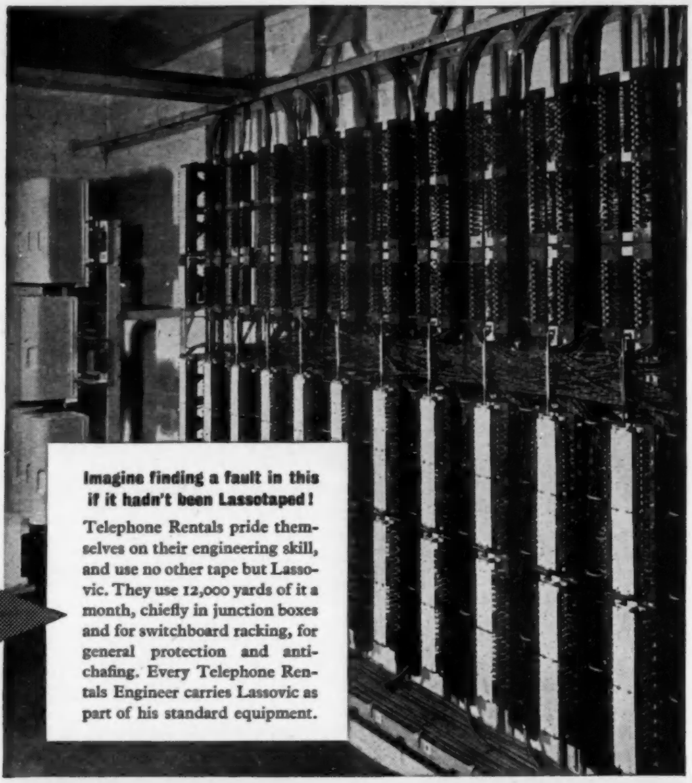

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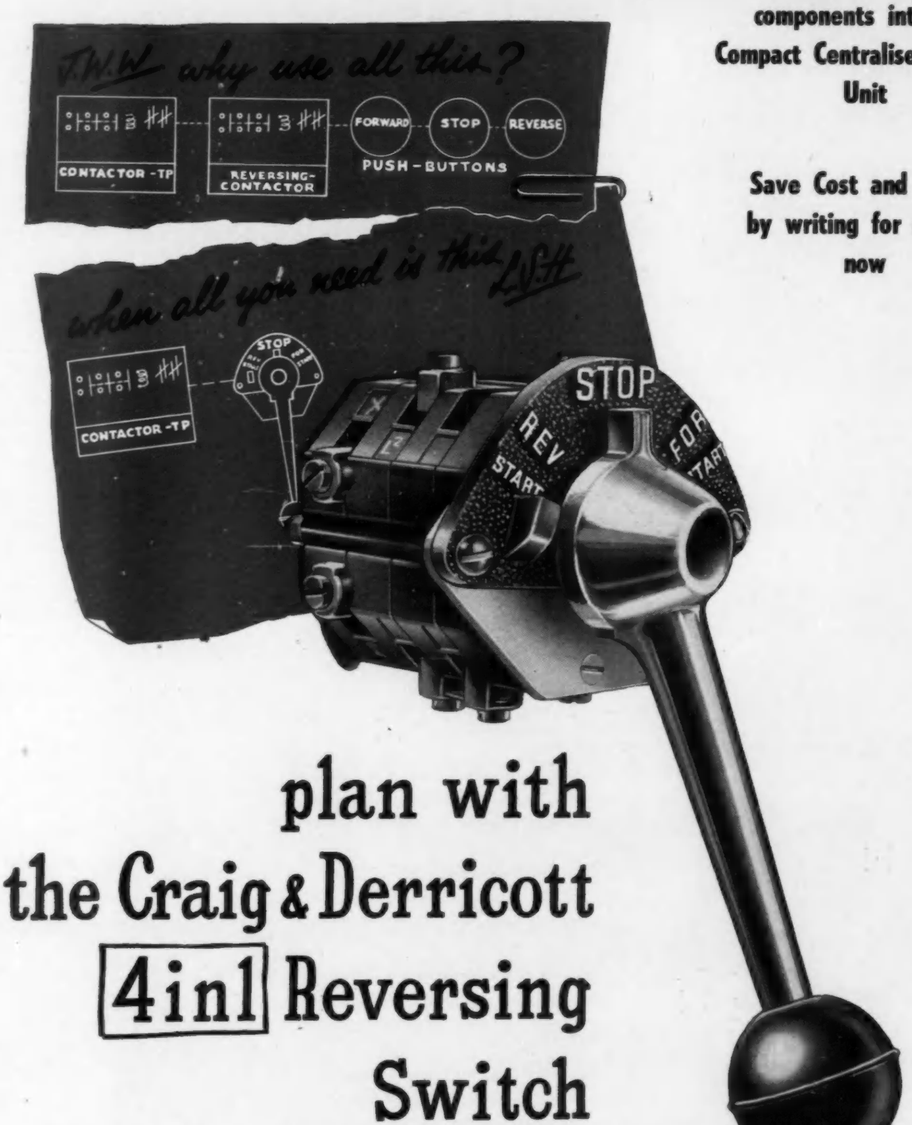

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Q5B100	100	3157	3158
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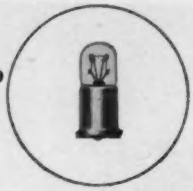

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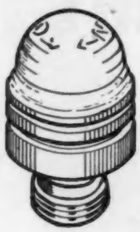

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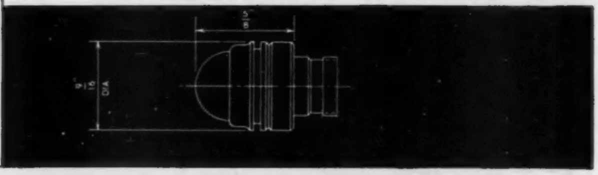

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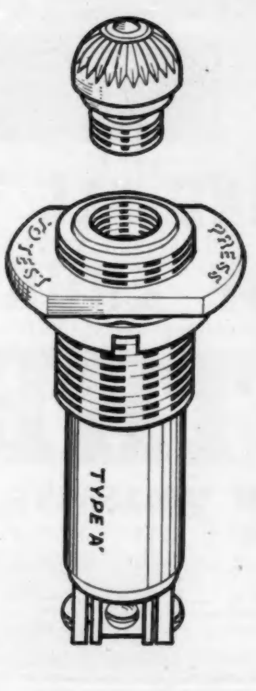

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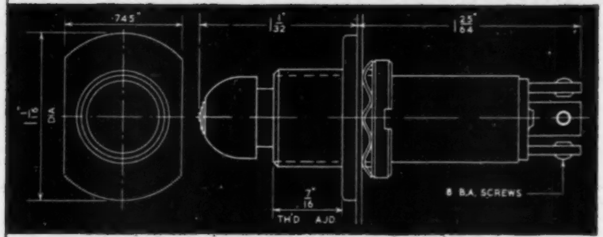

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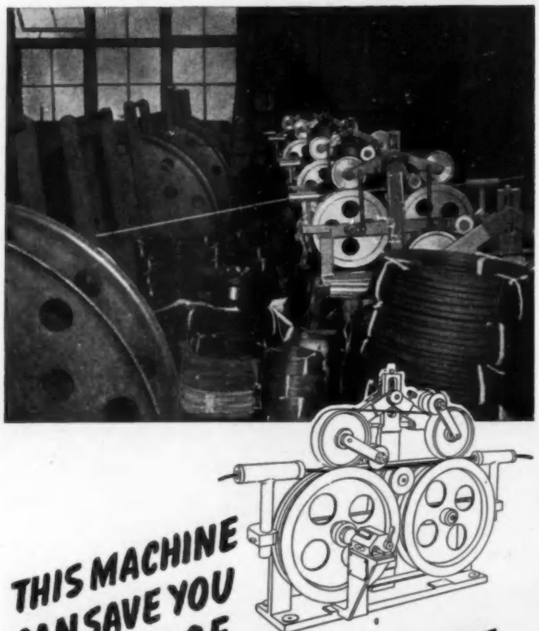

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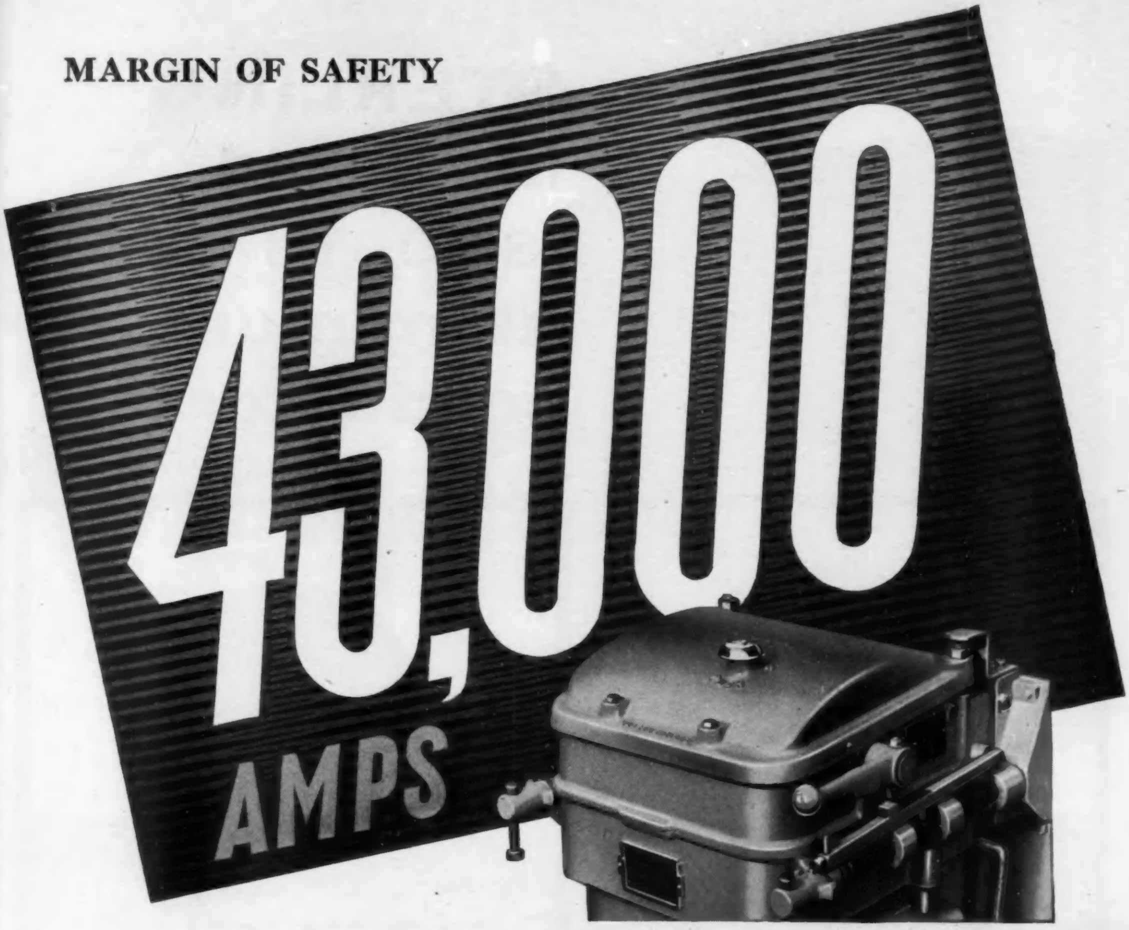

600 amp Ellison GEO circuit breaker cleared 43,000 amps on A.S.T.A. test (to BS. 116 : 1952)

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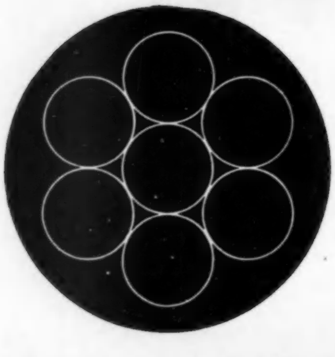

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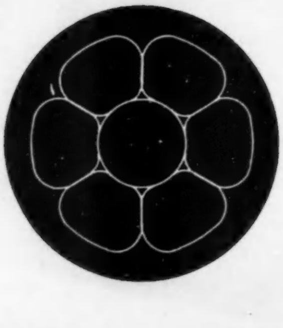

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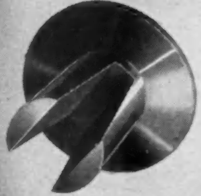

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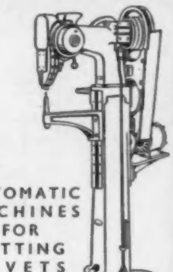

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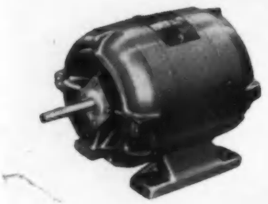

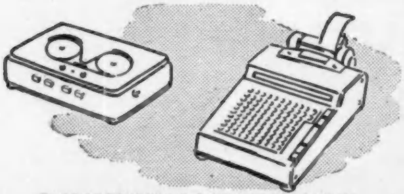

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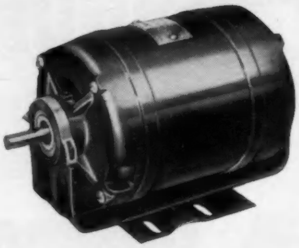

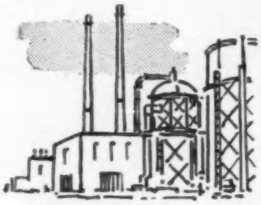

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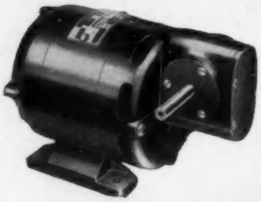

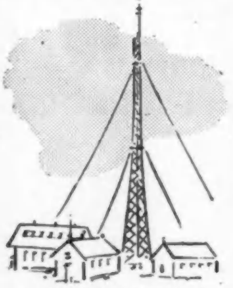

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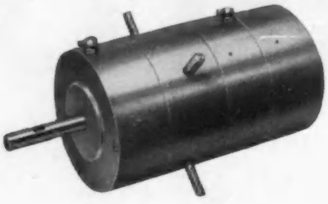

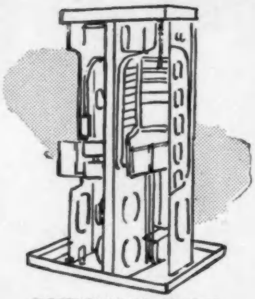

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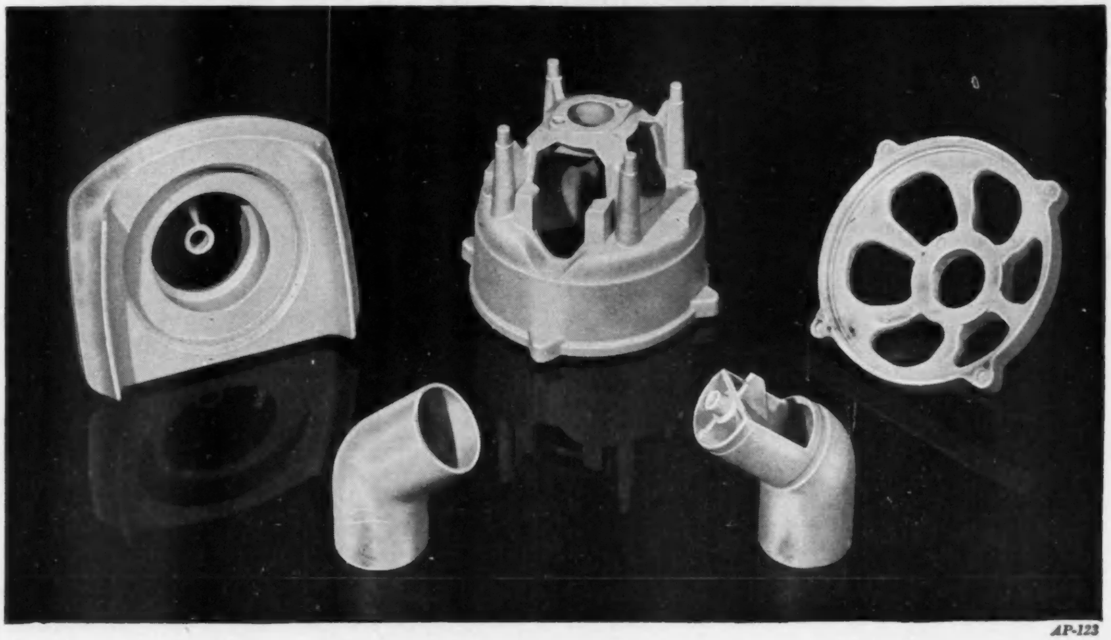

AP-123

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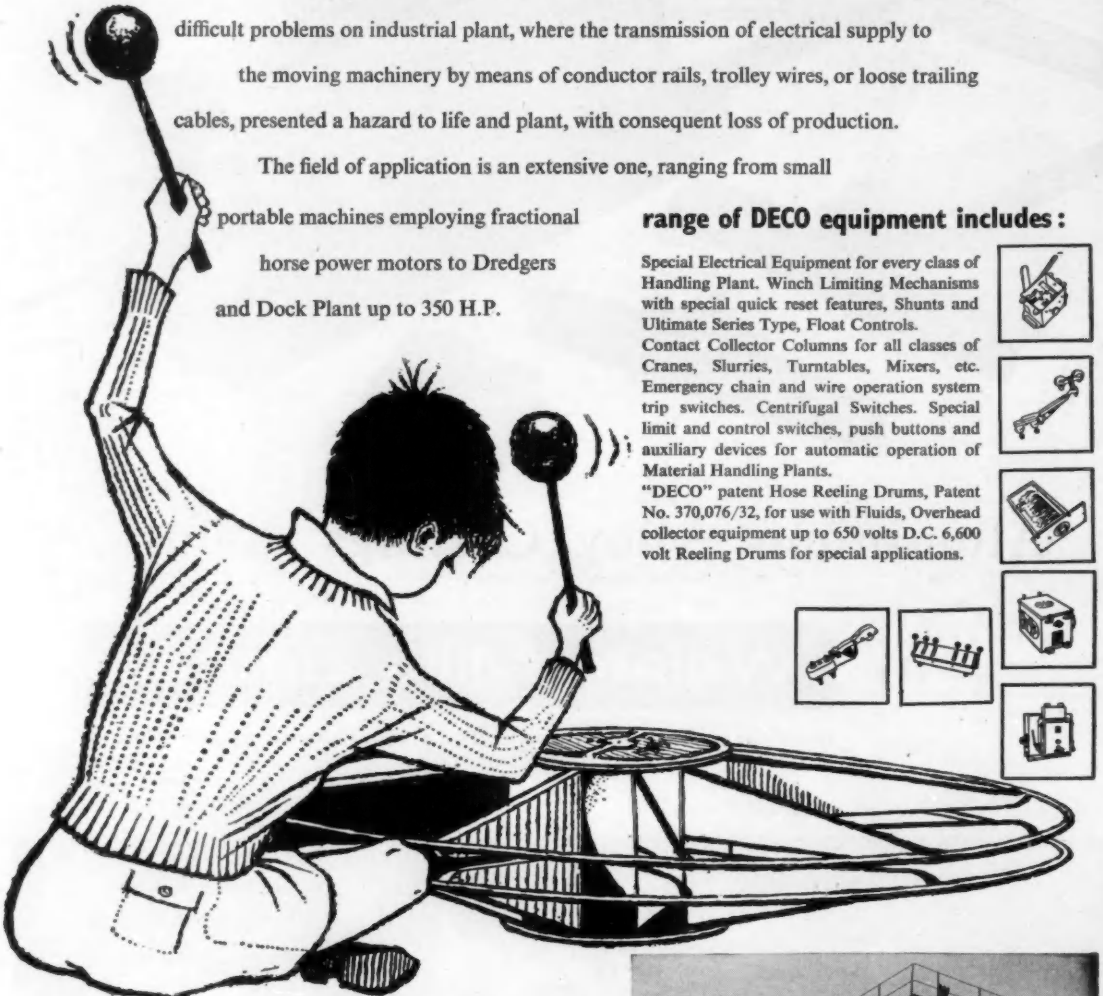

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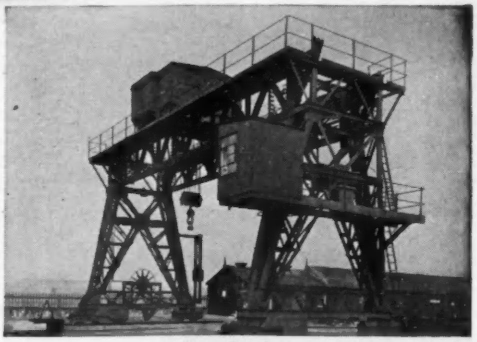

An illustration of a counter-weight operated radial reeling drum accommodating 130 feet of 4-core 1.3" overall diameter reinforced trailing cable for a 40-ton Goliath crane. (Photograph by kind permission of Messrs. Stothert & Pitt Ltd.)

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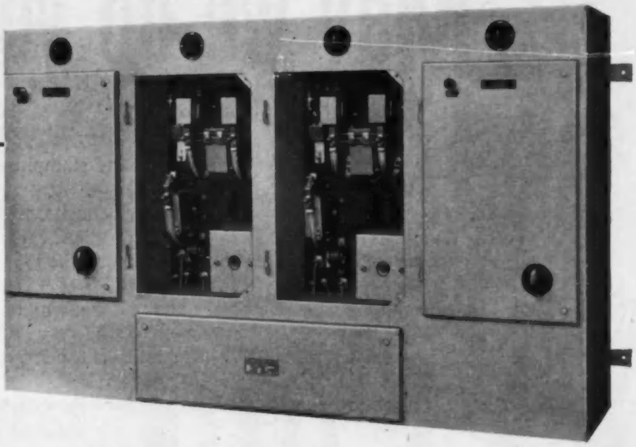

*Illustration shows a 4 Motor
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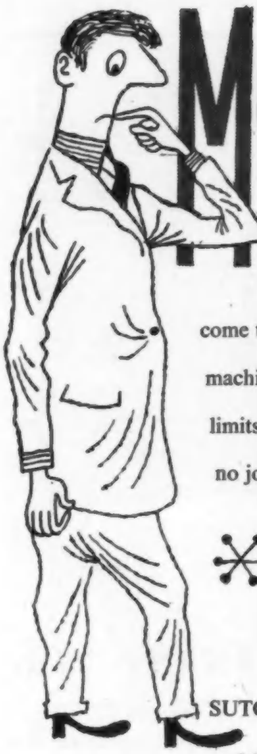

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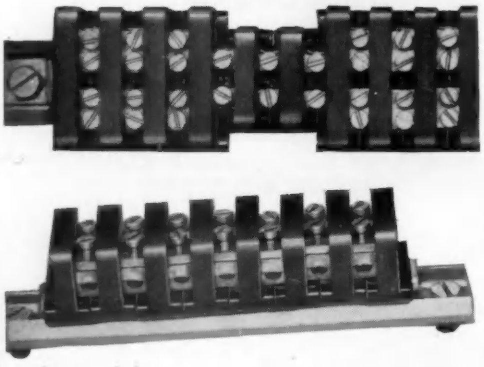

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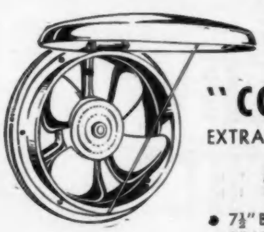

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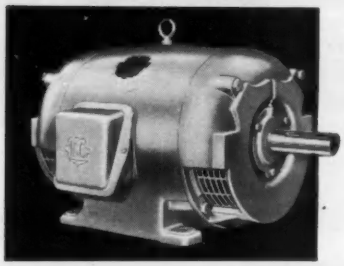

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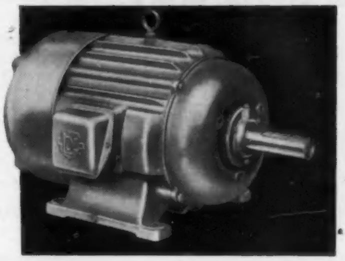

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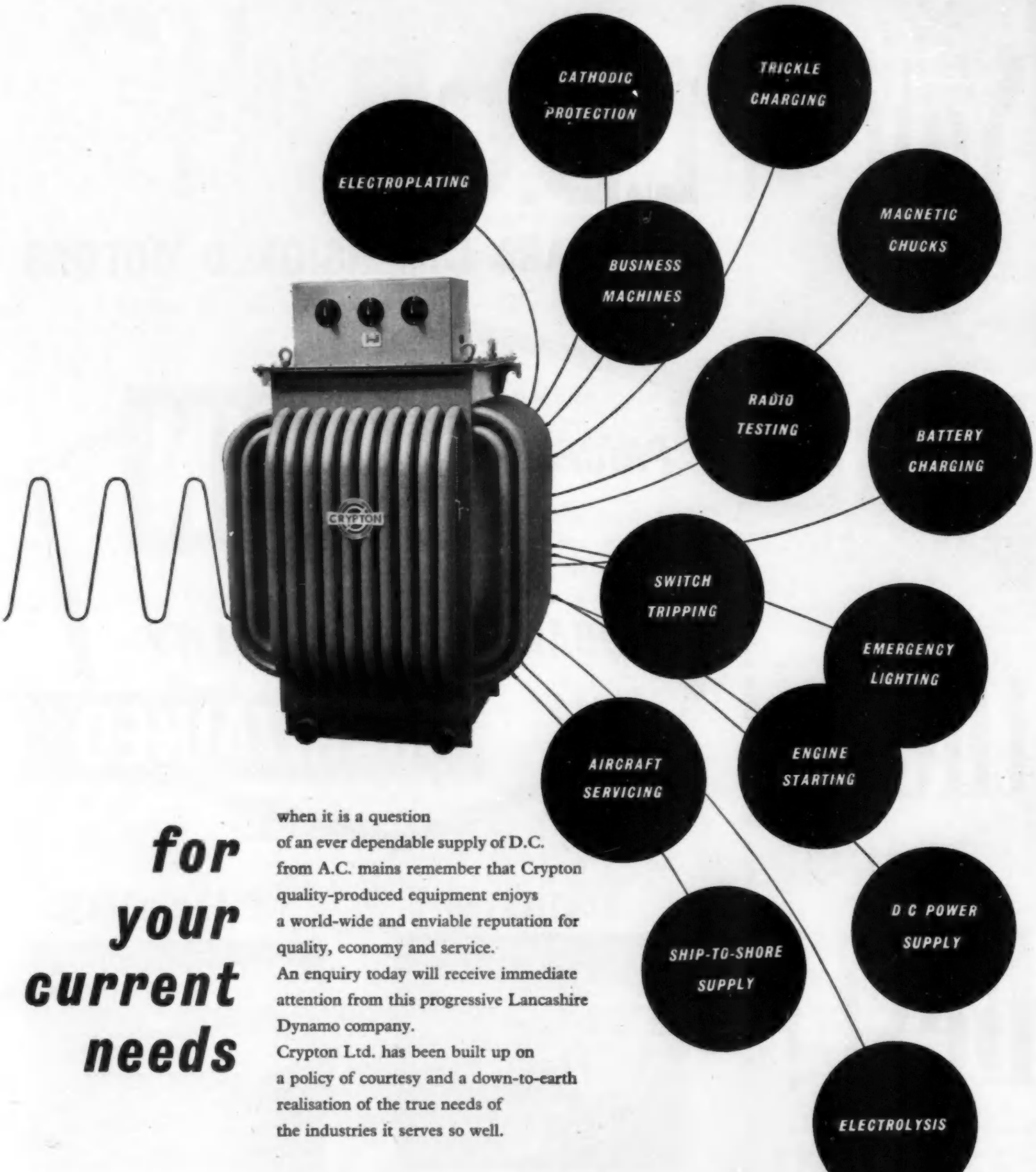
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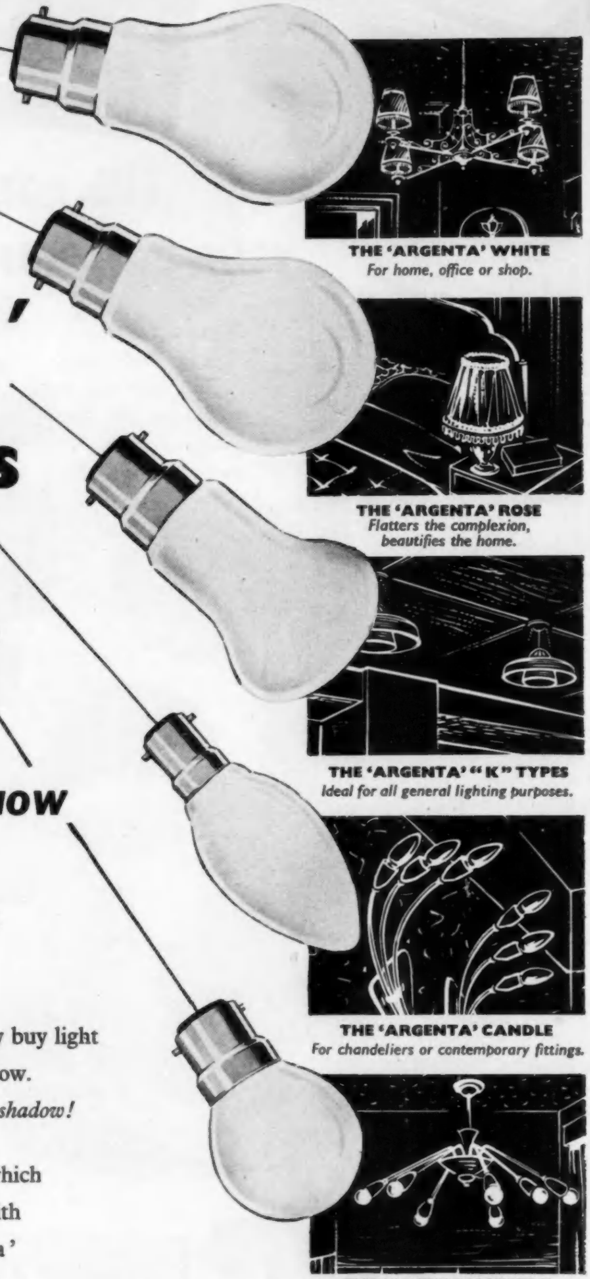

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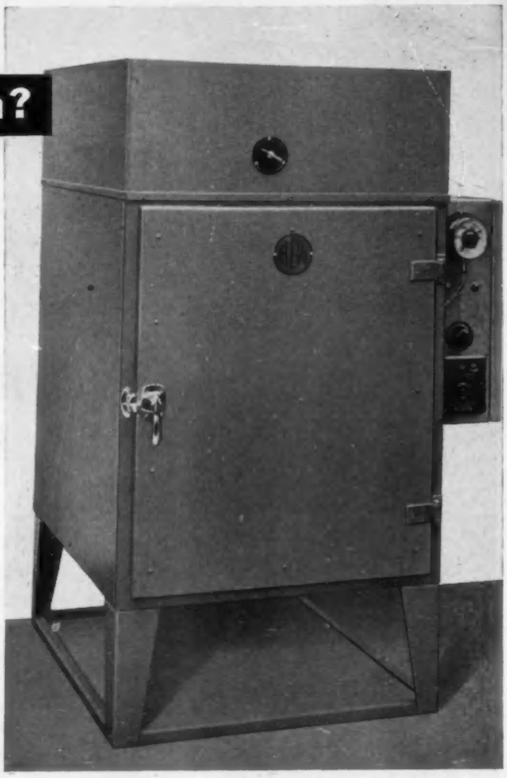

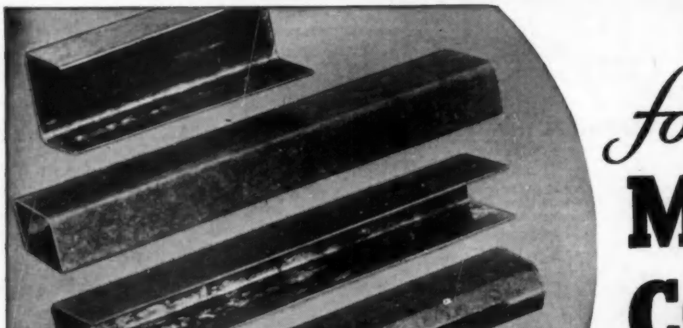

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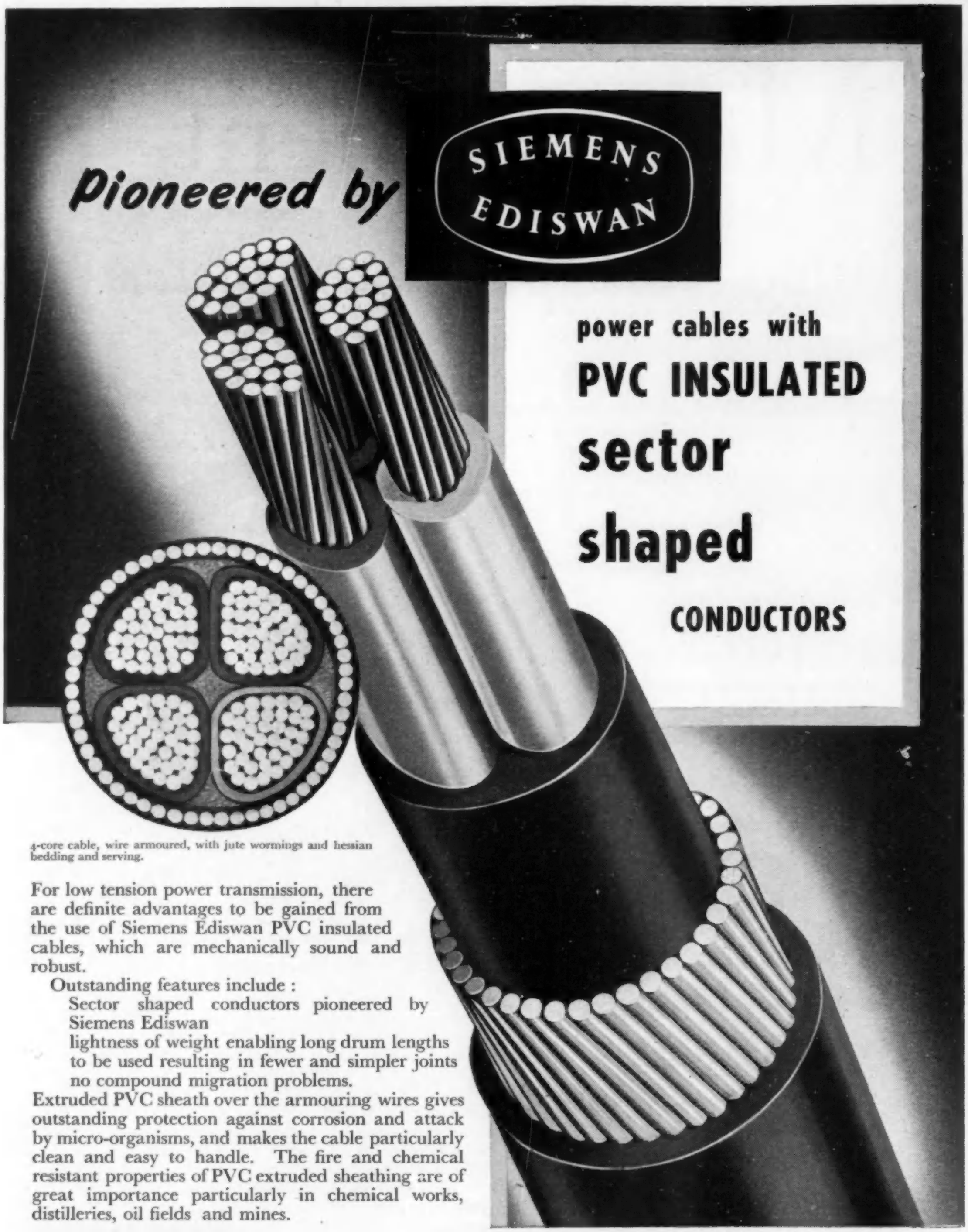

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FRIDAY
7 NOVEMBER
1958

ELECTRICAL REVIEW

Managing Editor: HUGH S. POCOCK, M.I.E.E. *General Editor:* J. H. COSENS *Technical Editor:* P. W. TUCKER, M.I.E.E.

In This Issue

Plant Load Factor	**847**	In addition to the encouragement of off-peak supplies, overall load factor may be improved by the transfer of generating capacity from light-load to heavy-demand periods, such as by pumping water to reservoirs at night to drive turbines in the daytime
Pumped Storage	**849**	Developments reviewed in papers presented at the Montreal meeting of the World Power Conference included the pumping-generating station associated with the Sir Adam Beck-Niagara scheme in Ontario and the Blaenau Ffestiniog project in North Wales
Breakdown of Electrical Equipment	**852**	Examples are given of actual plant failures and their remedies. In a number of cases investigations revealed unsuspected weaknesses which it was possible to correct. Many breakdowns could have been prevented by proper maintenance
Record Lending by World Bank	**857**	Loans made by the International Bank for Reconstruction and Development in 1957–58 included eleven for electric power schemes. They totalled £86·5 million compared with £39 million in the previous year
Digital Computers	**871**	Two papers on digital computers were presented at a meeting of the I.E.E. Measurement and Control Section this week. One dealt with an all-transistor type which has been in regular use since August, 1956, and the second with a new high-speed technique
Rogerstone Power Station	**873**	Two 60 MW Parsons turbo-generators operating with steam conditions of 900 p.s.i. and 900 deg F at the stop valves and two Babcock & Wilcox 550,000 lb/hr boilers have been installed and commissioned in this new power station near Newport, Mon., which was officially opened last week
Dalmarnock Extensions	**877**	On Friday last the Lord Provost of Glasgow inaugurated extensions at the South of Scotland Electricity Board's Dalmarnock station which was first commissioned 38 years ago
Domestic Electrical Equipment — Hair Dryers	**882**	Survey of models now available, with particulars of weight, element loading, motor rating, special features, finish and price

◆ ◆ ◆ ◆

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VOLUME 163 NUMBER 19 ◆ *Eighty-Sixth Year of Publication* ◆ FRIDAY PRICE 1s 6d

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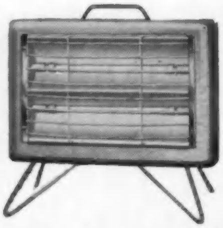

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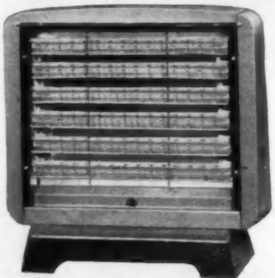

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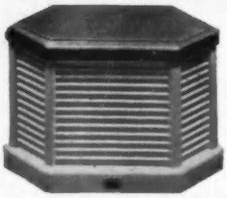

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ELECTRICAL REVIEW

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Plant Load Factor

As a means of improving the overall load factor of electrical systems the transfer of generating capability from periods of light loads to those of heavy demands should provide a valuable supplement in obverse to the encouragement given to consumers by tariffs and heat storage, for example, to take their supplies when spare plant capacity is available.

Pumping water to reservoirs by night for use in driving hydraulic turbines to meet the day loads has for many years been carried out on the Continent of Europe, where seasonal variations in water sources and other circumstances have proved this practice to be economical. Conditions in Great Britain have not been so favourable to water storage except to a somewhat limited extent in the north of Scotland. In this country grid interconnection over about a quarter of a century has enabled base loads to be carried by the most modern plant as it comes into service, leaving peaks to be dealt with by obsolescent units whose running costs only have to be taken into account. A second function of the older steam plant is to provide "hot standby." Although no fuel would be burned for this purpose with pumped storage, much more would be required, owing to losses in conversion, if an emergency were prolonged.

In its economic aspects the problem at present in Great Britain resolves itself mainly into a comparison of the overall cost of additional capacity provided by pumped storage with that of equivalent new thermal plant. Many engineering advances which make the prospect more favourable were discussed at the recent Canadian sectional meeting of the World Power Conference, as indicated in the technical papers reviewed on a later page of this issue. Among these are greater use of mechanisation in civil engineering work and the experience gained in the construction and exploitation of smaller upper reservoirs which have led to considerable reductions in expenditure. Turbine-pumps and motor-alternators as unit combinations can now be quickly reversed. New alloys are available, which should lessen maintenance. Computers are now being used to determine the most economic methods of operation. Progress in these and other ways has already led to a confident expectation of considerable reduction in the loss of energy in conversion. A notable new feature is the Deriaz development of the Kaplan turbine principle for use at higher heads, which brings it into the medium-head range of the less accommodating Francis machines.

What has given immediate momentum to the interest in this country in pumped storage is the advent of nuclear power stations, since their high capital cost per kilowatt necessitates, economically, their being run continuously at the highest plant load factor possible. The comparatively inexpensive pumped-storage equipment should make an appreciable contribution towards raising the base load during the night hours.

HOME AND EXPORT TRADE

The Government's decision to remove all restrictions on hire-purchase and rental agreements has to be regarded in the light of current economic conditions. The latest "Bulletin for Industry" prepared by the Treasury shows that in the first half of this year the total demand for goods was slightly lower than in 1957. It seems, however, that this was caused solely by a fall in exports and in public authority demand; home consumer demand was 2½ per cent higher. As a result of the overall decline unemployment showed an appreciable increase and it was to counteract this that the Government decided to loosen control upon expenditure.

Restrictions are unwelcome, although they are sometimes unavoidable, and both manufacturers and public are happy to see them disappear. But it is to be hoped that the expansion in home demand will not divert manufacturers' attention from the export markets. We cannot live by taking in one another's washing in this country.

GAS TURBINE TRACTION

It was announced last month that the gas turbine/electric locomotive, originally employed in the Western Region for experimental purposes, has been converted by British Railways for 25 or 6·25 kV all-electric working. The gas turbine has been replaced by a transformer and mercury-arc rectifiers and the roof of the Co-Co locomotive has been modified to accommodate the pantograph and air-blast circuit-breaker. Both cabs have been remodelled and re-equipped to the design of the first locomotives to be delivered under the modernisation scheme. The re-equipped locomotive is to be used for training drivers and testing overhead line equipment in advance of the first modernisation locomotives which will be delivered next year.

The replacement of the gas turbine by a transformer and rectifier does not mean any alteration of British Railways policy. The locomotive was used purely as a test bed and the gas turbine manufacturers are satisfied with the results. The application of gas turbines to traction appears to be confined to countries where coal and other energy supplies are limited. British Railways are to be congratulated on allowing British manufacturers to experiment and gain experience with gas turbine traction equipment in Great Britain under operating conditions.

FUTURE TECHNOLOGISTS

As recently announced in the *Journal* of the British Nuclear Energy Conference and in the *Electrical Review*, the Board of the Conference have admitted to membership the Joint Panel on Nuclear Marine Propulsion, an organisation which was set up in 1956 jointly by the Institute of Marine Engineers, the Institute of Naval Architects, the Institution of Engineers and Shipbuilders in Scotland and the North East Coast Institution of Engineers and Shipbuilders. This now gives the Board a membership of nine, which are:—The Institution of Civil Engineers, the Institution of Mechanical Engineers, the Institution of Electrical Engineers, the Institution of Chemical Engineers, the Institute of Physics, the Iron and Steel Institute, the Institute of Metals, the Institute of Fuel, and now the Joint Panel of Nuclear Marine Propulsion.

This is an indication of how widespread the nuclear energy movement has become throughout the profession and industry. In a way it also supports what was announced at the time of the formation of the British Nuclear Energy Conference, namely, that all the existing professional engineering institutions were so closely concerned with nuclear energy technology that it would be a mistake to form a separate nuclear energy engineering institution. All the same, we still feel as we did at that time that the new body of technologists which must arise in due course should have the door left open for them to form whatever kind of body they may think desirable in future.

REFLECTION ON RELIABILITY

For many years now electronic equipment has had the reputation of being complicated, and even a cursory glance at a modern electronic computer will confirm that this is a statement of fact. One would think it a virtual impossibility to visualise anything more involved than the complex array of resistors, capacitors, valves and multi-coloured wiring which go to make up even a modest-sized electronic computer.

The other day, however, we saw some mechanical computers which were intended for a specific military purpose. The workmanship which went into the making of these computers was of a very high order indeed and the finish of every component left nothing to be desired, but the conglomeration of gears, universal joints, mechanical integrators and small motors made the electronic computer look rather like a toy. We could not help feeling that the various functions of this machine could be more easily performed using electronic techniques and in a form which would be more easily accessible should a fault develop. It may be that in certain quarters electronic equipment is not yet regarded as being rugged and reliable enough.

DISTRIBUTION PROBLEMS

We have already said that the necessary concentration in recent years upon the provision of adequate generating plant has tended to force distribution into the background. Because of this emphasis on one side of the electricity supply business, accentuated by the rural electrification drive, many urban distribution systems have become overtaxed by the steady advance in consumption. Complaints of poor voltage are too frequent and in many instances supplies have had to be delayed or postponed. Now that the generating plant position is more satisfactory it is hoped that more capital will be available for the reinforcement of distribution systems.

It is strange to read in the *Electrical World* that there are distribution troubles in the United States too. In their case, it seems, the electrical utilities did not foresee the enormous growth of load which has been experienced. It is admitted that the forecasting of load—and its incidence in respect of areas—is not an easy matter.

At this year's sectional meeting of the World Power Conference held recently in Montreal particulars were given of the new type of reversible water turbine with a variable-pitch runner (the Deriaz turbine) installed in the pumped storage section of the Sir Adam Beck-Niagara power development in Ontario. Other papers dealt with the Ffestiniog scheme in North Wales and with the prospects of pumped storage in Scotland

PUMPED STORAGE

REFERENCES were made at this year's British Electrical Power Convention to a new type of reversible Kaplan water turbine having a variable-pitch runner which operates on a mixed-flow principle. This feature and consequent flexibility in operation permits of its use for pumped storage under higher heads (up to 600ft) than the well-established axial-flow Kaplan and also greater ability to cope with wide variations in head and flow of water. Any discharge rate up to the overload of the electric generator-motor is obtainable by pitch adjustment instead of fixed delivery for each head as for the conventional fixed-vane pump. Comparison with the characteristics of a fixed-pitch Francis machine is made in the graph on page 850 in which the extension of flatness of curve of the Deriaz type into the overload range is notable.

Particulars of the six 45,000 b.h.p. units commissioned last year at the Adam Beck power station, Niagara, for the Hydro-Electric Power Commission of Ontario were given at the recent sectional meeting of the World Power Conference at Montreal by the inventor, Mr. P. Deriaz (English Electric Co.) and Mr. J. G. Warnock (English Electric Co. of Canada). These sets are operated in reverse as 55,000 h.p. pumps delivering 3,450 cu ft/sec (at an efficiency of over 89 per cent) between 11.30 p.m. and 6.30 a.m. daily against a head of 75ft.

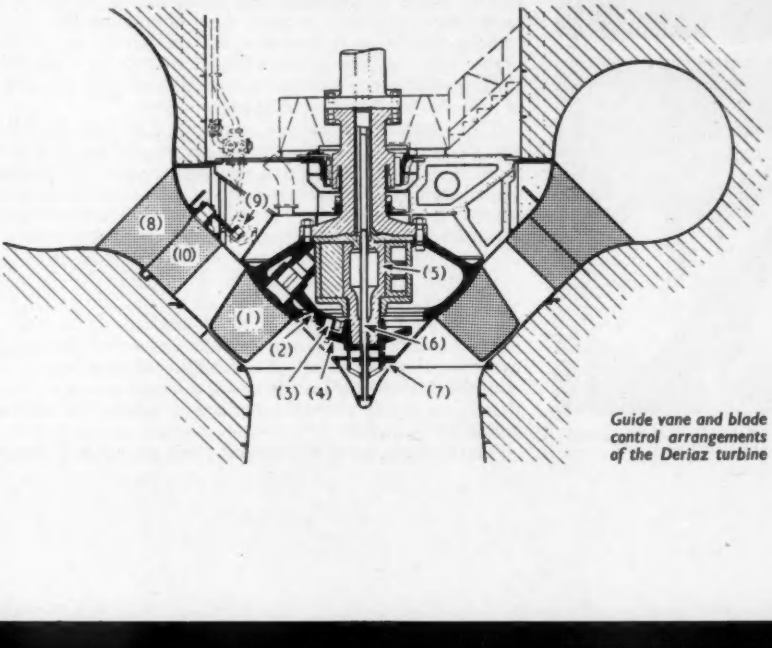
The cross-section shown below indicates how the guide-vane requirements are met by one adjustable flap (10) on each of the fixed stay vanes (8). The axis on which the flaps pivot is 45 deg to the vertical, each flap being controlled by an individual oil pressure servo motor (9). The flaps control the flow angle at the runner inlet and are deflected to the maximum at the lower heads when on turbine duty.

A blade-adjusting mechanism has been devised to suit the oblique position of the blade trunnions in view of the space restrictions on the servo motor inside the hub. The blade lever (2) is keyed to the trunnion of the blade (1) and engages with the operating spider (4), which is keyed to the vertical rotor shaft (concentric with the runner axis) of the servo motor (5). The essential feature of the assembly is the common intersection on the servo motor centre line of the blade trunnion and spider pivot axes. Transmission of the servo-motor torque is then obtained by blocks (3) which glide inside the parallel faces of the forked ends of the blade levers. Rotation of the servo motor relative to the runner hub is translated into axial displacement of the central tube (6) by a cam (7) to operate the governor restoring mechanism.

Left: Mr. P. Deriaz, chief designer, Water Turbine Department, English Electric Co., Ltd., Rugby

Right: Mr. J. G. Warnock, manager, Hydraulic Department, English Electric Co. of Canada, Ltd.

The runner blades, unlike those of the conventional Kaplan, can be completely closed. This feature allows the turbine to be shut down without closure of the gate or the inlet valve and results in a reduction of overall size. The torque required to rotate the runner with shut blades at full speed is likewise reduced, which permits easy starting as a pump by throwing the alternator directly on to the line even at full operating head. Running the alternator as a condenser does not involve tail-water depression by compressed air. To reverse direction of rotation when changing from pump to turbine operation merely necessitates feathering the blades and stopping and re-starting, which takes only a few minutes, then adjusting output by controlling the blade angle.

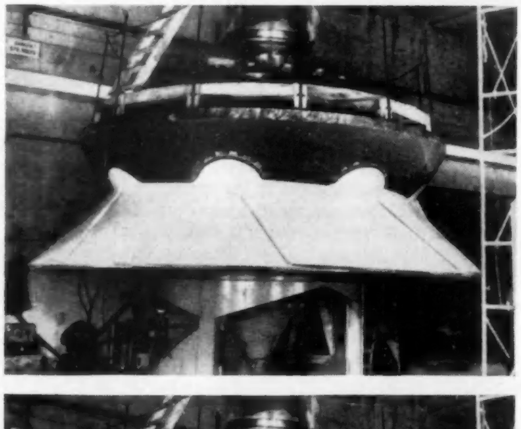


Guide vane and blade control arrangements of the Deriaz turbine

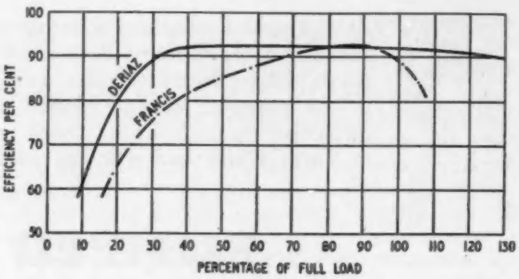
An appraisal of the benefits secured by pumped storage at Adam Beck was made by Mr. M. Ward (Hydro-Electric Power Commission of Ontario), who described it as an integral part of the overall developments, the value of which would have been severely curtailed without it. The criterion used in determining the economic feasibility of the scheme was the comparative annual cost that would have been incurred in installing additional thermal capacity.

The Commission required reversible pump-turbines of the largest capacity that could be provided and chose six of 55,000 h.p. with adjustable variable-angle blades and diagonal flow made by the English Electric Co., as described above. Points in their favour were stated to be ability to select a wide range of powers or discharges at various head conditions, all at relatively high efficiencies; the bedding of adjacent blades on each other, permitting complete closure, thus eliminated conventional wicket gates with their operating mechanism; the starting problem encountered with conventional Francis pump-turbines would be minimised, since the blades are closed prior to starting, and the resistance of the runner in water is reduced and depression of the tail water or the use of special motors is unnecessary. Speed is the same for both pump and turbine operation, enabling the change between the two to be readily made.

The generators rated at 31,000 kVA, 92·3 r.p.m. are divided into two groups of three, each group being connected to a 13·5/237 kV delta-star 38,000 kVA transformer bank. Starting is at full voltage with a maximum current of 2½ times full-load current. Operation is by remote control from the main power station or locally.



Impeller-runner of mixed-flow, variable-pitch, reversible pump-turbine showing the blades closed and open



Comparison between efficiencies of mixed-flow, variable-pitch runners and fixed-pitch Francis design

Automatic adjustment of the turbine blade angle provides for conditions of maximum discharge, maximum efficiency or maximum power and for constant discharge or constant power.

Annual charges are: fixed, $4,711,000; operation and maintenance, $150,000; net losses in pumping-generating cycle, $300,000; total $5,161,000. Corresponding figures for alternative thermal-electric system (which would have involved no cycle losses) would have been $6,311,000 and $1,260,000; total $7,571,000, showing a net annual difference of $2,410,000 in favour of pumped storage, exclusive of other advantages.

Welsh Project

Another pumped storage undertaking, the Blaenau Ffestiniog scheme in North Wales scheduled for commissioning in 1961-62, was the subject of a paper presented on the same occasion by Messrs. E. S. Booth (Central Electricity Generating Board) and Geoffrey Kennedy (Messrs. Kennedy & Donkin). Conversion efficiency was assumed to be 67 per cent at full load, but later plant guarantees indicated at least 72·5 per cent overall. The pumping period is taken as from midnight to 6.30 a.m. and the generating period as four hours of daily peaks in winter. The maximum storage capacity of 60 million cu ft will give a daily output of 1·2 million kWh, corresponding to a plant capacity of 300 MW. Incremental loading of steam plant in order of merit limits pumped-storage generation to 300 hours per annum at full load on winter weekdays, when operation for short peaks would alone be justifiable, making the "economic" annual load factor 3·5 per cent. At other times (estimated at 700 hours per annum) the plant would provide an immediately available reserve, thus eliminating the need to keep boilers up to pressure, but this saving would be partly offset by the greater fuel consumption incurred through emergency operation. Commissioning of 360 MW of new coal-fired sets could be postponed.

Total capital expenditure on pumped storage (including £2·145 million for transmission) would be £14·785 million, compared with £25·2 million for equivalent steam plant taken as £65/kW (60 and 120 MW sets). Capital charges in the first case, based on a 4¼ per cent annuity, showed a saving of £0·761 million a year over steam plant. Running costs in the first year were estimated to save coal worth £0·182 million, but this operational saving would be turned into a deficit of £0·625 million owing to the postponement of 360 MW of modern steam plant. With the inclusion of other works costs the estimated overall saving would be £0·207 million in that year, but with the diminishing load factor of the ageing steam plant that figure would probably increase to nearly £1 million within 15 to 20 years.

The turbines are of the vertical-shaft 428 r.p.m. Francis type designed to develop 105,000 b.h.p. over a head range of 925 to 1,020ft. Weighted efficiency at 970ft head between 60 and 100 per cent load is stated as 91·6 per cent, but is expected to reach 93 per cent as the maximum. Each generator is rated at 79,000 kVA at 0·95 p.f. and 16 kV, at which its designed efficiency is 98·3 per cent. When motoring at unity power factor the pumps will be uncoupled from the turbines on shutting down. Change-over times from pumping to generation are given as 9·25 min (automatic) and 12·75 min (manual); from generation to pumping the corresponding times are 20·75 and 24·25 min. By performing certain operations simultaneously, however, it is expected that the station can be brought on to full-load generation in 15 to 20 min and that all four pumps can be in service in 35 to 40 min.

Each generator is controlled by a 16 kV, 1,500 MVA oil circuit-breaker and two are connected to one 160 MVA water-cooled transformer stepping up to 275 kV at which the output will be transmitted four miles to the Board's projected nuclear station at Trawsfynydd and thence to Connah's Quay thermal station.

Messrs. Freeman, Fox & Partners are the consulting engineers responsible to the Board in association with Messrs. James Williamson & Partners and Messrs. Kennedy & Donkin. Contractors for the mechanical and electrical plant are: English Electric Co., Ltd., in association with Sulzer Bros. (London), Ltd., water turbines, storage pumps and valves; British Thomson-Houston Co., Ltd., alternator-motors; and Ferranti, Ltd., step-up transformers.

Left: Mr. E. S. Booth, chief designer and construction engineer, Central Electricity Generating Board

Right: Mr. Geoffrey Kennedy, partner in Kennedy & Donkin

Pumped storage was also considered by Messrs. J. Henderson (South of Scotland Electricity Board) and C. L. C. Allan (North of Scotland Hydro-Electric Board) in a paper discussing the economic integration of coal-fired, nuclear and hydraulic generation. The high head of many Scottish water power schemes, with short tunnel lengths and limited storage capacities, the authors pointed out, make them suitable for pumped storage requirements. The lower reservoir, however, must be large enough for flows during both pumping and generation without undue fluctuations in its level or of head on the pumps. A number of good sites exist with heads up to 1,100ft and two of these could use Loch Lomond as a lower reservoir with a combined potential capacity of over 1,500 MW.

Mr. J. Henderson, chief engineer, South of Scotland Electricity Board

The rating of the largest generator for any type of power station should not, in Scotland, exceed 8 per cent of the total load on the system. The high capital cost of new plant and the relatively small improvements in efficiency to be expected in the future might not always justify the present practice of installing it for high load factor operation and relegating older plant to peak-load duties. The alternative of installing peak-load plant, such as pumped storage, therefore called for consideration. For nuclear power stations the probable increase in output of reactors in relation to size and improvements in design might reduce their capital cost to between £80 and £100 per kW. In association with pumped storage, costing about £40 per kW, there would be better prospects of a reduction in overall cost than with coal-fired stations.

It is concluded that hydro-electric resources should be developed where available and that nuclear generation should be located where alternative resources are not available. At present prices they should be built only where requisite for base-load operation, except in conjunction with pumped storage. The cost per kWh generated by pumped storage must include the cost of production at either coal-fired or nuclear stations and will be about 50 per cent greater than the initial cost of the kWh used for pumping.

The provisional programme of generating plant extensions, 1958 to 1970, in Scotland provides for 3,290 MW (sent out) of which 700 MW will be pumped storage stations at Loch Awe (400 MW in 1964-65) and at Loch Lomond (300 MW in 1967-70). Of nuclear stations, Hunterston in S.W. Scotland (300 MW) will be in commission in 1961-62 and the first section of another station in N.E. Scotland (500 MW) in 1966. Computer studies are in hand to examine the many complex problems involved in pumped storage, including the economic limit of pumping throughout the year, optimum storage capacity and ratio of installed capacity of pumping to generating plants.

E.R.A. Reports

Aluminium Welding.—Report Ref. Z/T112 "Arc and Bead Characteristics for Pure Aluminium for a Range of Wire Feed Rates (Self-adjusting Arc) at a Constant Voltage in Argon" by J. C. Needham and A. A. Smith (price 12s 6d) describes carefully controlled weld tests made over a large range of wire feed rates at constant arc voltage, and the significance of the metallurgical and electrical features is discussed in relation to the arc and bead characteristics. In these tests the range for satisfactory welding is limited and the existence of sub-threshold and defective regions outside this range is established. The work was carried out at the E.R.A. under the research programme on the welding arc and the investigations on the self-adjusting welding arc were conducted jointly with the British Welding Research Association.

Cable Rating Factors.—Report Ref. F/T186, "Methods for the Calculation of Cyclic Rating Factors and Emergency Loading for Cables Laid Direct in the Ground or in Ducts," by H. Goldenberg (price 5s) is a survey in a form convenient for direct use of the methods which were presented in full in report Ref. F/T184.

Since the thermal capacity of the cable and the variation of cyclic rating factor with cable depth are neglected, a slight error is introduced in rating factors calculated by the method given in this report. This error is usually negligible, but the thermal capacity may be taken into account, if desired, by reference to the original documents. The report is a companion to Ref. F/T183, published in 1955, which contains tables of continuous current ratings and rating factors for cables up to 33 kV conforming to B.S. 480 : 1954 and B.S. 608 : 1955.

Copies of these reports are available, at the prices stated, from the Electrical Research Association, Thorncroft Manor, Dorking Road, Leatherhead, Surrey.

Breakdown of Electrical Equipment

Some Remedial Aspects

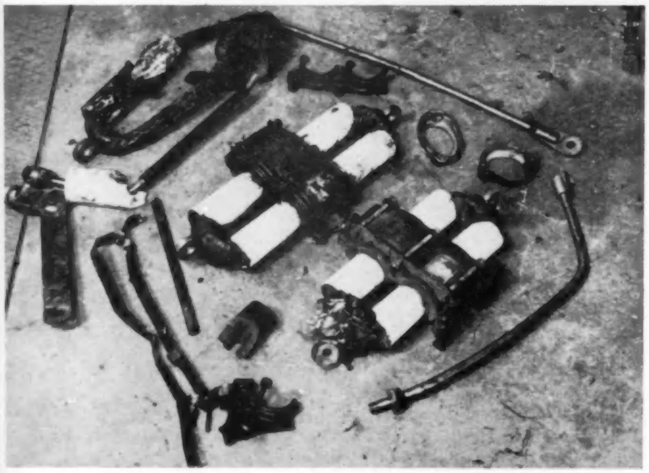
By F. E. NOAKES*

The author discusses emergency measures which must be carried out when a failure of electrical plant occurs. A distinction is drawn between temporary repairs and partial permanent repairs. Examples of breakdowns and their remedies are given

THE repair of electrical equipment after breakdown is not always the straightforward matter which it may at first seem. The engineer charged with the responsibility of effecting the repair will, of course, endeavour to return the plant to normal operation with the minimum of delay, or in the event of extensive repairs being necessary, make alternative arrangements to maintain production. If no standby plant or suitable spares are available, production may be seriously reduced, if not actually halted. An immediate temporary repair is sometimes out of the question, but a quick permanent but partial repair may be possible.

Whether a temporary repair can and should be made will depend, amongst other things, on the nature and extent of the damage, the availability of labour, and the length of time the equipment will have to continue in service before permanent repairs can be carried out. A temporary repair must, of course, be effective until the equipment can be spared for a more permanent repair as a further failure may increase the extent of the damage. Consideration must also be given to the question of safety, as any temporary repair or measure likely to cause danger cannot be contemplated. Emergency measures which may be acceptable in one case may be dangerous in another. For instance, it may be quite safe to dispense with a damaged isolating switch for one particular machine, whereas to do so for another may be highly dangerous.

Fig. 1.—Damaged current transformers and connections from a 7,300 V switchboard



The engineer will, of course, make an investigation into the cause of the damage, and the result of this may well influence his decision. In cases where it is external to the damage, the cause will have to be removed.

A recent mishap involved an oil immersed circuit-breaker on a h.v. switchboard when, although temporary repairs were out of the question, emergency measures were taken which enabled production to continue. The switchboard consisted of six panels, each of which carried a double-pole oil immersed circuit-breaker, an air-break isolating switch, busbars and instruments, and was fed from a circuit-breaker on the main board in the factory substation. The supply was two-phase at 7,300 V 50 c/s and the breakers were all rated at 300 A. One panel was used to control the incoming supply, the remaining five being outgoing panels supplying a lighting load, three rotary convertors and a welding shop. The maximum calculated load carried by the incoming breaker was 250 A. The board was carrying its normal daytime load when, without warning, the incoming circuit-breaker exploded.

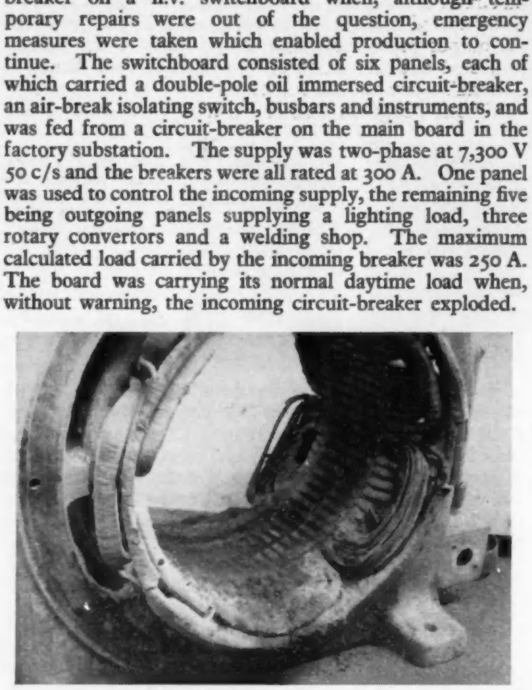


Fig. 2.—Burnt out stator of a 60 h.p. motor

An immediate examination of the entire board was made to assess the damage and discover, if possible, the cause of the explosion. This examination revealed that one of the outgoing breakers was at fault. Arcing had occurred from a primary terminal of one of the current transformers to earth, and due to this the primaries of both the current transformers were open circuited. Probably because of this, the fault current failed to operate the breaker, and the main incoming breaker tripped instead. An arc was maintained between the contacts in the incoming breaker and an explosion occurred in the oil tank. The fault was ultimately cleared by the supply authority's breaker on the main board.

The damage was found to be extensive; the incoming breaker was completely wrecked, the top casting being fractured in many places and the oil tank buckled. The main force of the explosion appeared to have been directed upwards, and the current transformers, which were mounted above the breaker, were dislodged and soaked with oil from the tank. The connections between various points were badly bent, and a number of insulators broken, Fig. 1. It was immediately obvious that complete repairs would take some time, and that some emergency action would have to be taken to recommission this switchboard. The faulty current transformers were removed and the circuit-breaker disconnected. Between the faulty incoming breaker and the supply there was a further breaker (the supply authority's) in the works main substation, and it was therefore considered safe to connect direct on to the busbars of the affected switchboard as a temporary measure.

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* Vulcan Boiler & General Insurance Co., Ltd.

After assessment of the damage, it was considered necessary to put two new current transformers on the outgoing panel and to fit a complete new breaker, isolating switch and current transformer to the incoming panel. It was also necessary to rewire the incoming panel and to renew the main connections. The instruments from the panel were overhauled and re-calibrated and approximately twenty weeks elapsed before repairs were completed. No explanation could be found for the failure of the breaker to clear the fault, other than the possibility that its rupturing capacity was insufficient to interrupt the extremely high fault current.

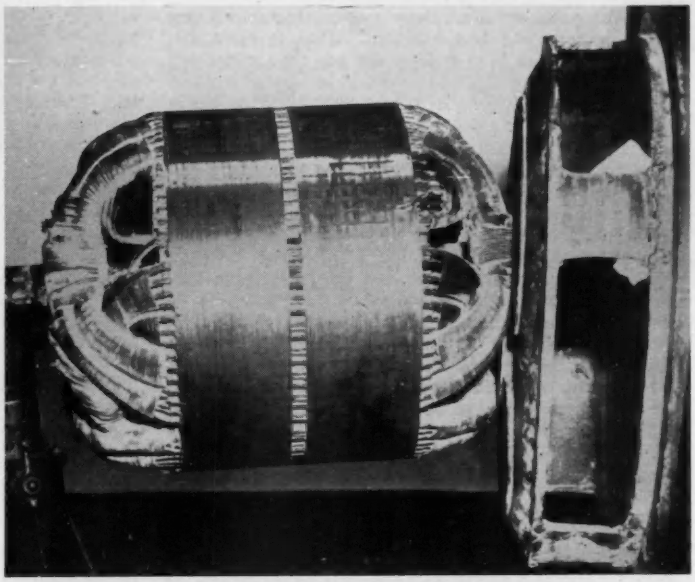


Fig. 3.—Fused rotor coils and fractured end shield of a 55 h.p. motor

With rotating machines, it may be decided that a total rewind of a motor could be avoided by the replacement of one or two coils only, or broken parts could be welded or otherwise repaired in preference to renewing them. Where worn parts are involved they would have to be built up and re-machined, or replaced. If they are to be built up, the method to be employed would have to be considered with regard to the suitability of the material deposited, and the time required for the process. If the amount of machining necessary after building-up involves heating, consideration would have to be given as to whether this can be done safely without causing damage to other parts. It is quite likely that none of the processes immediately available would meet all the requirements and a compromise would have to be made, selecting the process which would do the job and present the least difficulty.

Damaged windings of a rotating machine can often be repaired quite simply by winding in new coils. Fig. 2 illustrates the damaged stator winding of a 60 h.p. motor which was effectively repaired by winding in three new coils. Whether this type of repair will be economical, depends upon the age and condition of the remainder of the winding. Frequently, a winding which appears quite sound apart from the faulty section, turns out to be badly deteriorated when disturbed, thus involving an extensive repair.

The recent breakdown of a 750 kW, 125 V, 1,000 r.p.m. generator illustrates this point. Shortly after starting up, a fault developed in the machine and smoke issued from the commutator end of the winding. The set was immediately shut down and on testing the armature winding the insulation resistance was found to be zero. After being opened up it was evident that a flashover had occurred on the end ring at the front of the winding and the solder had melted from a number of the commutator joints. A considerable accumulation of copper and carbon dust was found under the windings, particularly at the commutator end, and it appeared that the fault might be cleared by cleaning. This was carried out and the commutator joints re-soldered, but on running the machine again, arcing took place between the top and bottom layers of the winding, causing appreciable damage to several of the conductors. Due to the deteriorated condition of the insulation a localised repair could not be effected and there remained no alternative but to replace a dozen or so burnt conductors and re-insulate the rest of the winding. It is believed that the action of centrifugal force at the point where mica insulation overlapped the winding ring may have caused the insulation to crack and splay outwards, permitting the entry of copper and carbon dust.

Other Considerations

Even in cases where urgency is not of prime importance problems as to the best method and type of repair may well arise, and then the dominating factors affecting a decision will probably be the cost and efficiency of one type of repair compared with another. Another factor having a bearing on the type of repair to be made is, as already mentioned, the cause of the breakdown. An inherent weakness in design or construction may be revealed, and if modified or corrected may considerably reduce the risk of future breakdown. The investigation may also reveal unsuspected weakness or faults in associated equipment which could be corrected when the main equipment is being repaired.

The breakdowns described in the following paragraphs illustrate how a thorough investigation into the cause of failure revealed weaknesses which it was possible to correct.

Fig. 3 illustrates a breakdown involving the rotor of a 55 h.p. 400 V four-pole motor driving a grinding machine. On examination it was found that fractures had developed across the ribs of the end shield at the driving end of the motor and this had allowed the rotor to drop and foul the stator core. The resultant overheating caused the insulation of two of the rotor coils to fail inside the slots, and at the point of failure there was considerable fusing of the coil turns. Subsequent examination revealed that the end shield had been welded at some time previously and the fractures which had now developed ran close to and parallel with these welds. It was fairly evident that in the process of welding the end shield, distortion had taken place and the residual stresses in the metal eventually led to fracture. In addition, the stress on the driving end bearing and end shield appeared to have been aggravated by the excessive overhang of the heavy motor pulley with its eighteen groove vee belt drive. After consideration it was decided that in order to effect a satisfactory repair it was desirable to completely rewind the rotor using new material, and to replace the end shield. Furthermore, as trouble of a similar nature had been experienced before, it was considered that the only permanent solution would be to fit an outside pedestal bearing to support the weight of the pulley and relieve the load on the driving end bearing. Since being modified this machine has given satisfactory service.

Another breakdown of some interest concerns a 460 V, 2,500 kW, 500 r.p.m., d.c. turbo-generator running in tandem with another similar generator giving a combined output of 5,000 kW. The set was shut down after its circuit-breaker tripped out and it was apparent that a short circuit had taken place behind the risers at the back of the commutator. The effects of the arc were also evident on the field coils, whilst the commutator showed signs of burning at one position which extended over several bars. The brush-gear was slightly marked due to the severe sparking which had occurred. It was also clear from the preliminary examination that a fault had developed in the armature end coils, and steps were immediately taken to open up the machine. The steel binders were removed and when the coils in the region of the fault were lifted it was seen that the short circuit had occurred between the coils and the equaliser connections. Both were badly fused and the micanite insulation appeared to be in a deteriorated condition. Fig. 4 shows a general view of the armature with the coil ends lifted at the seat of the fault. Fig. 5 shows a number of armature coils removed and the fused coil ends can be seen. Although it was possible that the faulty coils could have been renewed, it was considered advisable, in view of the brittle condition of the insulation, to completely rewind the armature. As the defective machine was the inner of the two tandem generators it was decided to transfer the armature from the outer machine to the frame of the inner machine. Both the machines were identical in construction and the change-over presented no great difficulty. The set remained in service with one generator until the repaired armature was returned about three months afterwards.

Fig. 4.—Defective armature of a 2,500 kW generator

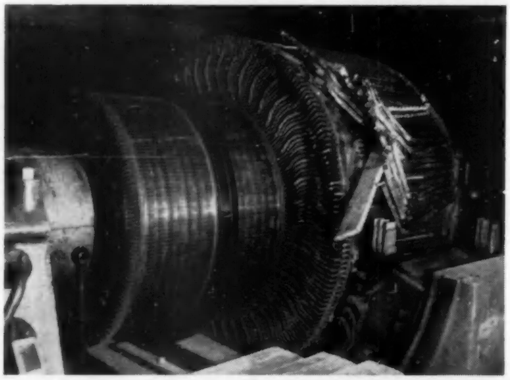
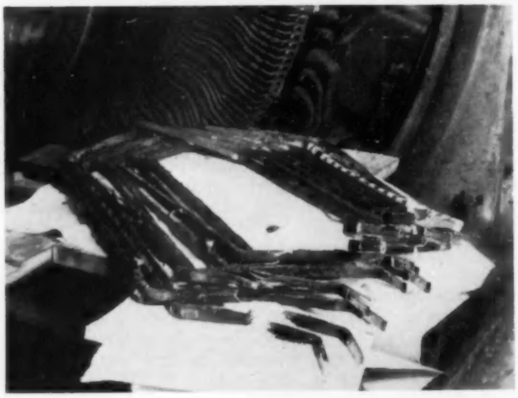


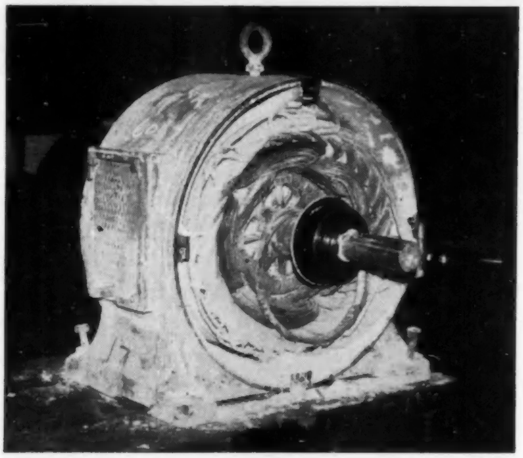
Fig. 5.—Fused conductors of the generator shown in Fig. 4



Some months later a sister machine suffered a similar breakdown, and when the machine was opened up it was disclosed that once again a short circuit had occurred behind the risers at the back of the commutator. As in the previous case, it was found that the short circuit had occurred between the coils and the equaliser connections. The armature was rewound, but in this case the manufacturers were consulted with a view to moving the equaliser connections to the other end of the winding, as it was apparent that copper and carbon dust were accumulating behind the risers, and that this accumulation was leading to short circuits between the coils and the equaliser connections. It was found that it would be possible to carry out the suggested modification whilst rewinding, and instructions were given for it to be done. The set has since been working satisfactorily for a number of years.

An unusual fault occurred on a 750 kW, 1,500 r.p.m. alternator. While running normally on approximately full load, small pieces of flaked mica were observed to be coming away from the interior of the machine. The set was shut down at once, and when tests were applied it was found that the field system on the four-pole salient type rotor had broken down to earth. Subsequent

Fig. 6.—Burnt out rotor of a 25 h.p. motor. The photograph clearly shows the accumulation of foreign matter which undoubtedly led to the failure



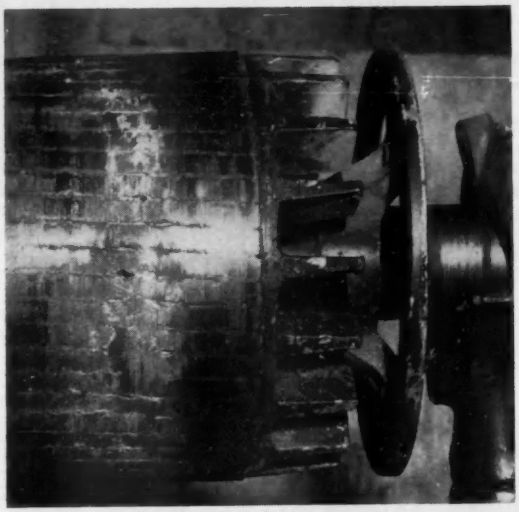


Fig. 7.—Damage to squirrel-cage rotor resulting from failure of motor bearings

examination after removal of the rotor disclosed that the mica flanges between the field coils and metal clamping plates had loosened and were beginning to disintegrate. A similar fault had occurred on this generator some years previously, and it was considered advisable to forward the complete machine to the makers for repair. Here it was established that definite shrinkage of the rotor coil insulation had taken place, coupled with the movement of the coils in service. Such movement combined with an accumulation of dust and dirt in the spaces between the poles and coil ends seems to have given rise to earth faults, and it is probable that these accounted for the unusual vibration observed on the set just before it was taken out of service. From a careful study of the rotor design it seemed clear that too great a thickness of insulation had previously been employed in these coils which had led to shrinkage and consequent movement while in use. To eliminate future trouble from this source the makers considerably reduced the thickness of micanite at both top and bottom of the coils, and for additional safety the micanite was secured by woven glass tape. The further precaution was taken of pre-ageing the rotor coils before they were assembled on the poles. This was achieved by the passage of a heavy current through the coils in order to heat them to a temperature considerably higher than would be attained in service. All the securing bolts were then thoroughly tightened to remove excess varnish from the insulation, and by a process of continued baking and tightening a solid and secure clamping of the coils was achieved.

It is perhaps relevant to note that the alternator was of a fair age and that manufacturing techniques have considerably improved since it was manufactured. It does show, however, that a thorough investigation into the cause may lead to improvements or modifications to the machine which take advantage of newer techniques, and so reduce the breakdown risk on older, but still serviceable, equipment.

Maintenance

Many of the breakdowns which have come to the author's notice could have been prevented had the cause been discovered earlier by proper maintenance. It is essential that the correct size and type of machine be provided for a particular duty. Regular cleaning, blowing-out of the windings, and the wiping down of all casings, housings and sliprings during regular inspections is necessary to remove dust and dirt before they have a chance to accumulate and unite with other harmful substances. The checking of bearing filler caps, dust seals and gaskets will reduce the risk of breakdown due to dust. In very dusty situations steps may have to be taken to protect the machine by enclosing or screening it, always having regard to the fact that ventilation must not be impaired. New installations should be designed carefully and use made of totally enclosed or pipe ventilated machines in the less favourable situations. Sliprings and commutators should be regularly inspected and the brushes correctly bedded, and any rough spots or grooves should be removed by using a commstone or in severe cases by

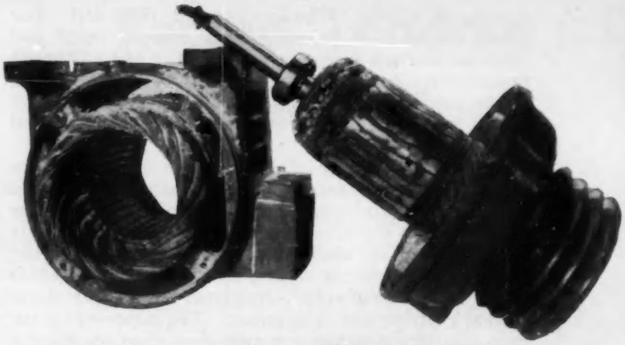


Fig. 8.—Damage to a 25 h.p. motor due to bearing wear

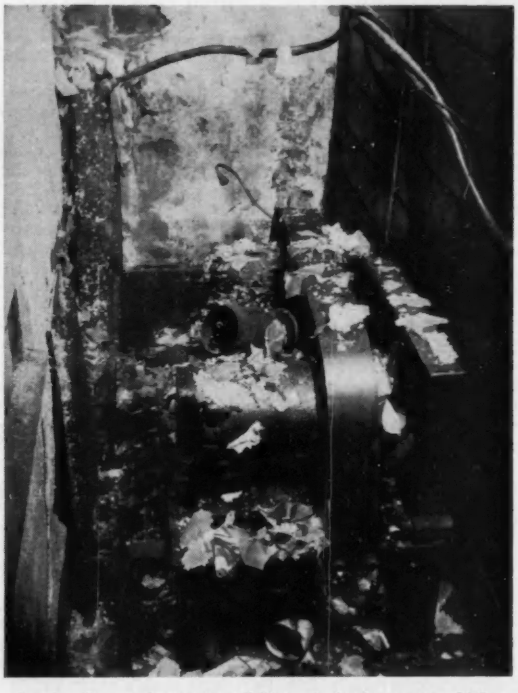


Fig. 9.—Disrupted capacitor of f.h.p. single-phase motor driving a refrigerator compressor

turning in a lathe. The gap between rotor and stator should be checked regularly, any changes noted and bearings renewed if necessary. Figs. 6, 7 and 8 illustrate breakdowns caused by wear, and dust and dirt, and each of these three failures could undoubtedly have been prevented had the motors been regularly inspected and maintained.

Protection should be afforded against overload by the provision of efficient overload trip devices and these should be of the correct capacity and properly set. Regular inspection and check will ensure that they work correctly and disconnect the machine from the supply if and when an overload does occur. Fig. 9 illustrates a mishap which occurred to a single-phase fractional horsepower motor driving a refrigerator compressor. The motor was of the capacitor start/induction run type, and when the internal centrifugal switch failed, the starting winding and the capacitor were left in circuit for a prolonged period. The capacitor overheated and exploded and the motor burned out. If the overload devices had operated correctly it would only have been necessary to replace the internal switch. As it was, it was decided that a new motor was desirable. Periodical inspection and maintenance of driven machines will also help to reduce the possibilities of overload on the motor. There can be little doubt that attention to these matters will reduce the incidence of breakdown and in many cases it will be found that the cost of such maintenance is more than paid for by the saving in wasted man and machine hours which inevitably follow a breakdown.

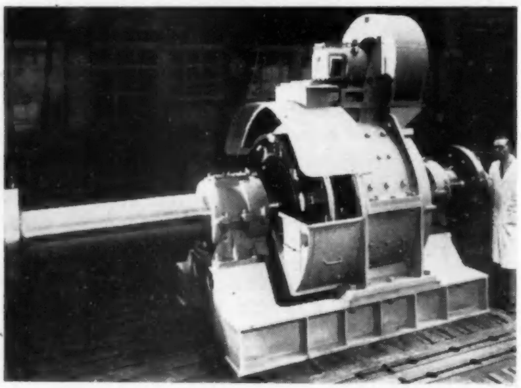
Acknowledgment is due to the Vulcan Boiler & General Insurance Co., Ltd., for the photographs, and for their kind co-operation in allowing the author to quote from their files.

SHAFT-DRIVEN SHIPS' GENERATORS

USING a ship's main engines to drive the auxiliary power supply generators offers several advantages. The elimination of an auxiliary prime mover results, in addition to a valuable saving of space, in lower running costs, less maintenance and the carrying of fewer spares. In some cases the generators are chain- or belt-driven and in others by direct gear drive or through couplings of various types. For vessels such as tankers, which are in service for many days in the year, and require extra power, an arrangement whereby the generator is built around the intermediate propeller shaft can be used. This does, however, introduce certain problems peculiar to the environment and conditions. The generator voltage must be controlled against shaft speed irregularity, in particular that brought about by sea-going conditions, in addition to load variation. Relative movement may exist between the machine and the hull, and shaft currents must be short circuited to prevent electrolytic action either within the ship's structure or the main engine bearings.

W. H. Allen, Sons & Co., Ltd., of Bedford, have designed and constructed shaft-driven generators for installation in the 18,500 ton motor tankers *London Majesty* and *London Victory* owned by London & Overseas Freighters, Ltd. These machines are rated for 150 kW at 110 V d.c. and have a Brown-Boveri automatic voltage regulator to maintain constant voltage over a speed range of 80/126 r.p.m. An independent 110 V d.c. supply has been used for excitation, and the machines are watertight up to the underside of the shaft to guard against the possibility of water in the tail shaft compartment. The generator shaft conforms to the design and proportions of the existing intermediate propeller shaft except for that section carrying the commutator and armature which is forged up to a diameter greater than the couplings, enabling the commutator to be withdrawn over the coupling if necessary. Longitudinal ventilating ducts are ploughed out of this increased diameter, forming arms to which the core discs are attached by tapered keys. The stator and pedestal bearings are secured to a bedplate made by the North Eastern Marine Engineering Co., Ltd., the manufacturers of the main machinery for the two vessels.

A 150 kW shaft generator for installation in the m.v. "London Majesty"



Although the electrical connections received special consideration to eliminate magnetic fields around the shaft, two brushes capable of running on an oily steel shaft are provided earthed directly to the ship to short-circuit any stray currents. The commutator end bracket is designed to take a grinder for truing the commutator *in situ* when necessary, and the main poles and interpoles are detachable, being withdrawn from the driving end. Heaters are fitted in the bottom of the commutator end-plate to maintain a temperature in excess of the ambient, preventing condensation when the machine is not in use.

Because of its low speed, the machine is force-ventilated by a separate cooling fan, the direction of air flow ensuring that carbon dust is blown away from the commutator and windings, and a filter fitted in the air trunking removes oily vapour. Audible alarms are fitted operating on ventilating fan failure, or a voltage drop due to the speed falling below 80 r.p.m., and a margin of safety is provided by the adoption of an unusually large air gap preventing damage due to exceptional wear in the bearings, each of which is fitted with a gauge checking the wear taking place.

In view of its low speed and special design, the cost per kilowatt of the generator only is comparatively high, but advantages gained by using this type of machine should enable the capital cost to be recovered in a reasonably short period.

ARC MOVEMENT

THE first stage of an experimental investigation carried out at Queen Mary College (University of London) into the effectiveness of arcing devices on high voltage insulators is described in a report Ref. O/T19 "The Movement of an Arc Between Parallel Horizontal Rods Fed from One End in Still Air and in a Wind" by A. E. Guile (price 12s from the E.R.A. at Thorncroft Manor, Dorking Road, Leatherhead, Surrey). Alternating current arcs of up to 3,000 A between parallel horizontal rods fed from one end were photographed in both still and moving air, and some tests with direct current arcs were made on rods of various materials. Further stages of the work cover the protection of insulators on systems up to 33 kV from damage by arcs, particularly under wind conditions.

ELECTRICAL LOANS HEAD THE LIST

Record Lending by World Bank

BY A SPECIAL CORRESPONDENT

Since the International Bank for Reconstruction and Development began operations in 1947 loans for electric power development have represented 40 per cent of the total amount sanctioned. Our correspondent gives details of the eleven loans aggregating £86·5 million made in 1957–58

DURING the fiscal year ended 30th June, 1958, the International Bank for Reconstruction and Development made thirty-four loans totalling the equivalent of £253 million in eighteen different countries. Eleven of the loans were for electric power development in nine different countries and amounted to the equivalent of £86·5 million. This compares with the previous year's lending—which was also a record year—of £138 million in total and £39 million in respect of power development. For the first year since the Bank started lending operations in 1947 the amount of electric power loans was exceeded by those for transportation—including highways, port and rail development—but in the total since 1947 electrical loans still head the list, accounting as they do for some 40 per cent by value of all loans advanced.

WORLD BANK ELECTRICAL LOANS, 1957-58

Country	Purpose	Amount $ million (U.S.)
Austria ...	Expansion of existing hydro plants.	3·6
Brazil ...	Hydro-electric project and transmission lines.	13·4
Ecuador ...	Hydro-electric project and expansion of system.	5·0
Italy ...	Thermal and hydro projects ...	29·2
Japan ... (two loans)	Hydro-electric projects ...	62·0
Mexico ... (two loans)	Thermal and hydro projects ...	45·0
Pakistan ...	Thermal plants and transmission lines.	14·0
Philippines	Hydro-electric projects ...	21·0
Thailand ...	Hydro-electric projects, irrigation and flood control.	66·0

A satisfactory feature of the year's "trading" is that of all loan funds spent on imports by borrowing countries 18·8 per cent found its way back to the United Kingdom. This compares with 38·8 per cent spent in the United States and 17·2 per cent in Western Germany and shows that the United Kingdom, as the second largest "shareholder," receives a due proportion of the business placed by borrowing countries. Since international bidding for contracts is insisted upon in almost all cases British prices, to say nothing of technical ability, do not seem to be greatly out of step with those of her main competitors.

Following is a brief description, country by country, of the projects which have received financial assistance from the Bank during the last fiscal year. (Loan figures have been expressed in dollars as this is the currency in which the Bank's "units of accounts" are kept.)

Austria: The loan of $3·6 million is additional to the loan of $10 million made in June, 1955, for the important Lünersee hydro-electric project. The additional funds are needed to complete the scheme by increasing total capacity to 550 MW. A large proportion of the power produced will be exported to Germany as well as increasing the supply available in the Austrian provinces of Vorarlberg and the Tyrol.

Brazil: Loan of $13·4 million to the Usinas Eléctricas do Paranapanema S.A. ("Uselpa") for the construction of a hydro-electric project at Jurumirim on the Paranapanema River. This is the second of a series of power plants and associated transmission lines which Uselpa is building on the river. (The first was the 68 MW Salto Grande plant, for which the Bank made a loan in 1953, put into operation earlier this year.) The present project consists of a dam 179ft high, a power house with installed capacity of 85 MW, and two transmission lines—one to connect with the Salto Grande plant and one running to the city of Sâo Paulo. In this area of Brazil demand is so great that other plants will need to be built even after the completion of the Jurumirim plant.

Ecuador: Loan of $5 million to the Empresa Eléctrica Quito S.A. for the expansion of existing supplies to overcome an acute power shortage in Quito and the surrounding area. The new plant, eventually, will add 40 MW to existing supplies; the present distribution system needs to be expanded to take the additional power.

Italy: Of $75 million lent to the development authority Cassa per il Mezzogiorno $29·2 million is being re-lent to two power companies to help finance projects which will add a further 360 MW to systems serving Southern Italy. A 300 MW thermal plant is to be built at Naples and a 60 MW pumped storage hydro project at Guadalami in Sicily.

Japan: Two loans amounting in all to $62 million, advanced to the Japan Development Bank, are being re-lent to private corporations as follows:—

(i) $37 million to the Kansai Electric Power Corporation to construct a dam 610ft high and an underground power station with a capacity of 258 MW. The Bank loan will cover foreign exchange expenditure of some $7 million; the remaining $30 million will be applied to domestic expenditure. The Kansai company serves the chief industrial area of Japan, including Kobe and Osaka, where important textile, chemical, machinery and shipbuilding industries are situated.

(ii) $25 million to the Hokuriku Electric Power Co. for the construction of a dam on the Joganji River 3,280ft above sea level. The Joganji River is on the west coast of Honshu Island; five new power stations are scheduled to be built at various elevations below the dam and will add 261 MW to existing capacity.

Mexico: (i) $11 million to the Mexican Light & Power Co., Ltd., to expand the company's generating capacity by 95 MW by the addition of a third generator at the Lechería thermal plant, which was built with the assistance of an earlier Bank loan.

(ii) $34 million to the Federal Electricity Commission to build three hydro stations and one thermal station.

The hydro plants will provide more power to the Mexico City area, the Veracruz area and to Guadalajara, Mexico's second largest city. The fourth project is the expansion of the Guaymas thermal plant in the important agricultural district of North-West Mexico.

Pakistan: $14 million to the Karachi Electric Supply Corporation, Ltd., to construct a 60 MW steam station and extend transmission and distribution facilities in the Karachi area. The new plant will double the supply of power in the Karachi area; it will use natural gas obtained from the Sui Gas Transmission Company to which the Bank made a loan three years ago for the construction of a 350-mile pipeline.

Philippines: $21 million to the National Power Corporation for the construction of the Binga hydro-electric project in Northern Luzon. The scheme covers the construction of a dam and reservoir on the Agno River, an underground power station with an installed capacity of 100 MW and transmission lines to Manila and various provincial areas.

Thailand: The largest single loan for any purpose ($66 million) made during the year was to the Yanhee Electricity Authority, an independent Government agency established in 1957 to operate the Yanhee project for the development of electric power, flood control and irrigation in central Thailand. The first stage of the project is the construction of a dam 500ft high on the Ping River, a power station with an initial installed capacity of 140 MW, substations and 650 miles of transmission lines to Bangkok which will supply eleven load centres at points en route. The total cost of this stage is estimated at the equivalent of $100 million and the Bank's loan will pay for imported equipment, materials and services. The entire project, when completed, is planned to provide a total capacity of 560 MW for which further Bank loans may be sought in due course.

Technical Assistance

The Bank continued to fulfil its role of meeting requests from member Governments for various kinds of technical assistance and resident representatives were stationed in Ecuador, Haiti, Honduras, Panama and Peru, as well as in India, Iran, Pakistan and Thailand to give general advice to their respective Governments on various aspects of development problems.

Survey teams have also been actively examining projects for possible loans in the future, among which may be mentioned schemes for hydro-electric development in Norway and Luxembourg, thermal power stations in Denmark, and further assistance for power development in Austria. An extension of the Rio Lempa hydro scheme in San Salvador has been considered as well as the drawing-up of an overall power development scheme for the Republic of Honduras. In Malaya the Cameron Highlands hydro-electric project has been surveyed; resulting from the Bank's appraisal a substantial loan for carrying out the first stage of the project has recently been approved.

The Bank and the Italian Government embarked on a joint study of the commercial practicability of using atomic energy for the production of electric power in Italy. The lack of conventional fuel, a high consistent demand for power and an already large and integrated system were among the reasons which led the study group to the conclusion that a nuclear power station would be commercially practicable.

Co-operation and advice was also forthcoming from the United Kingdom Atomic Energy Authority and from the United States Atomic Energy Commission who both assisted in reviewing technical aspects of the tenders.

After the invitation to tender had been approved by an international panel it was sent to seventeen companies, including eight American, five British and two French, calling for bids for a 150 MW nuclear power station to be completed in four years on a site on the west coast of Italy. In the event nine bids were received, one from France and four each from Great Britain and America. From recent reports it appears that the contract has been awarded to an American company and that discussions are proceeding with a view to a Bank loan being granted to finance the project.

Evaluating Projects

The Bank tries to run its business on the lines of a large private investment bank and, apart from its rates of interest, which are generally very reasonable, "hard lending" is the order of the day. Many of the projects submitted to the Bank in the early years of its activities had to be rejected because they were so badly conceived, which created the impression among member countries that the Bank was not very willing to help them.

In assessing a proposal the Bank has to make sure that the project would help to improve the economy of the borrowing country as a whole. A proposition for a power plant, for example, has to be judged from several points of view, the most important of which are economic, management and technical. On the economic side the Bank must be satisfied that the power created will be consumed and that the project will pay its way. Will it be properly managed and will trained personnel be available to service it? are two of the questions that have to be answered. To give an extreme example, should the Bank finance a coca-cola plant or a hydro-electric plant? From the aspects already mentioned, and from the angle of profitability, it might be better, from the Bank's point of view, to finance the coca-cola plant, but from the point of view of the borrowing country as a whole the hydro-electric plant would be a better proposition. The Bank never makes a loan for the total cost of a project; indeed it seldom advances more than half the cost, and loan funds so advanced are generally used to pay for imported equipment, materials and services.

Engineers and the Community

THE greater part that engineers should take in every-day affairs in industry, public life, Parliament and cultural pursuits was the underlying theme of an address given by Mr. A. G. Milne (deputy chief engineer, South Western Electricity Board) as chairman of the Supply Group of the Western Centre of the Institution of Electrical Engineers at Bristol on 20th October.

Mr. Milne said that engineers should assume a greater responsibility for the solution of the problems thrown up largely by the industry and inventiveness which had created the highly industrialised civilisation of to-day. The tradition in public life that the classics belonged to culture and science did not, died hard. Leaders of the engineering industries had pointed out that the remedy lay in broadening education in schools and universities where science must be elevated to a place beside Latin and Greek.

Neglect of science by humanists, and of the arts by engineers, resulted in cultural inadequacies in both—deficiencies which were felt in industry, commerce and government. Mr. Milne stressed the need for the higher education of the engineer and devoted the last part of his address to the affinity of the engineer and the artist.

VIEWS on the NEWS

By REFLECTOR

MORE and more the difficulty of reconciling economic development with natural beauty grows. In its 1957-58 report the Lancashire Branch of the Council for the Preservation of Rural England acknowledges the need for electric power and does not wish to hamper its supply, but it says:—

> "Where the *Super Grid* comes the landscape inevitably becomes a wirescape, and increasingly the country-lover must deplore the blind acceptance of Parliament of an engineer's device which so ruthlessly disrupts the settled harmony of the countryside wherever it passes."

The Committee goes on to say that these projects should not be planned along the easiest channel regardless of the harm they do. There should be the fullest investigation of alternative routes and all the planning objections weighed against economic and technical advantages. But surely a great deal of attention is already paid to these matters. It is unfortunate that alternative suggestions made by objectors are invariably unadoptable because of technical or financial difficulties.

* * *

While others may express fears and utter protests against the erection of a nuclear power station in their vicinity Weston-super-Mare boarding-house keepers (if the rather remote *Newcastle Journal* is to be believed) are said to be "talking excitedly about a new Gulf Stream to bring them more prosperity in the 1960's." This is because of the discharge of cooling water at 65 deg into the Bristol Channel from Hinkley Point.

* * *

Naturally I am pleased to hear of new uses for electricity, but one recent application does not appeal to me very much. The *Observer* reports experiments at an American Army research centre which have proved that monkeys develop duodenal ulcers when they are subjected to mental strain. The animals used for the purpose were placed in restraining chairs so that they could move their limbs and heads but not their bodies.

> "They were given brief electric shocks at regular intervals—every 20 seconds in one experiment—but could avoid the shocks by pressing a lever. This they soon learned to do—but the necessity of pressing the lever seemed to subject the monkeys to considerable psychological stress, and some of them developed serious duodenal ulcers."

I ask in the language of our American cousins: "So what ?"

* * *

I seem to recollect that it used to be mainly in East Anglia that swans became entangled in overhead lines and caused power cuts. Lately, however, the reports of these suicidal birds have been coming from further south. The New Romney (Kent) Borough Council is particularly perturbed and has suggested to the Government that the birds should be exterminated or at least thinned out. To me this seems to be a great pity, but I did not realise how rapidly the swan population was growing. No doubt if they were re-introduced as table birds they would rapidly disappear.

* * *

Thornton Heath (Surrey) Chamber of Commerce is arranging illuminations for Christmas and it has been told that it cannot expect a reduction in the standard charge of 6d a kWh for electricity. One member strongly protested against "this exorbitant charge," and, says the *Croydon Advertiser,*

> "when another member asked if the electricity board had been told that the illuminations were 'a goodwill gesture to the people of Thornton Heath,' the member who protested said: 'What does the electricity board know about goodwill ? '"

So far as goodwill is concerned, I wonder whether the "gesture" of the tradespeople concerned extends to a reduction of *their* charges at Christmas. They will be unique if it does.

* * *

For a long time I have been unable to discover what was happening about the writs issued by the British Electricity Authority in 1949 against some local authorities in connection with the funds of those bodies when their undertakings were acquired by the B.E.A. and Electricity Boards. The Town Clerk of Lytham St. Annes shed some light on this subject when he reported at a recent Council meeting that as a result of negotiations the electricity authorities did not propose to pursue their claim for £23,000 against the Council—one of the authorities concerned.

* * *

The following note appeared in the *Electrical Review* of 2nd November, 1888:—

> "A communication which we have received from Mr. F. H. Webb, the courteous secretary of the Society of Telegraph-engineers and Electricians, contains information which is as surprising as it is satisfactory. The familiar but extremely awkward name of the Society is, as our readers know, to undergo a radical change, and the Society will in the future be known as the Institute of Electrical Engineers. We had no doubt whatever but that the change would be entirely acceptable to a large majority of the members, but we never dreamed that there would be such rare unanimity as has actually been displayed."

My readers, recalling the recent discussion on "institutes" and "institutions," will note that the *Review* itself started off on the wrong foot.

PERSONAL AND SOCIAL

News of Men and Women of the Industry

Mr. J. N. Toothill

Mr. J. N. Toothill, C.B.E., F.C.W.A., Companion I.E.E., Comp.Brit.I.R.E., F.R.S.E., has been appointed a director of Ferranti, Ltd. Mr. Toothill joined Ferranti's in 1935 as chief cost accountant, and was appointed general manager of the Edinburgh factory in 1942, which position he still holds. He has been closely associated with the company's activities in the electronic field. He is a vice-president of the Scottish Council (Development and Industry) and a member of the Scottish Civil Aviation Advisory Council, the Electronic Engineering Association Council, and the Equipment Group Committee of the Society of British Aircraft Constructors. He is also a governor of the College of Aeronautics, Cranfield.

The new president of the Institution of Civil Engineers is **Professor A. J. S. Pippard,** M.B.E., D.Sc., F.R.S., Professor Emeritus in London University, who retired from the Chair of Civil Engineering at Imperial College in 1956. He retains connection with the College as Senior Research Fellow in Civil Engineering. Professor Pippard delivered his presidential address to the Institution of Civil Engineers on Tuesday last.

It was announced in *The Times* last week that **Sir John Dalton,** a director and former chairman of W. T. Henley's Telegraph Works Co., Ltd., was married on 31st July to Miss Dorothy Irene Ashdown.

The Yorkshire Electricity Board has made changes in the District engineering organisation in the No. 3 (Sheffield) Sub-Area. In place of the existing Sheffield North and South Districts, four new districts have been established. In addition a Sub-Area System Standardisation Section has been set up to deal with the changeover of the Sheffield 355/200 V three-phase and 200 V two-phase distribution systems. These changes take effect as from 1st November. Consequent upon the reorganisation the following appointments have been made:—**Mr. W. C. Smith,** Associate I.E.E., district engineer, Sheffield North District, becomes sub-area senior assistant engineer (system standardisation); **Mr. R. G. Hancock,** A.M.I.E.E., district engineer, Sheffield South District, becomes district engineer, Sheffield Central District; **Mr. T. P. Milburn,** B.Sc.(Eng.), A.M.I.E.E., second assistant engineer, Sheffield North District, is appointed district engineer, Sheffield East District; **Mr. P. S. Parton,** first assistant engineer, Sheffield South District, becomes district engineer, Sheffield West District; and **Mr. B. F. D. Haywood,** A.M.I.E.E., second assistant engineer, Sheffield North District, becomes district engineer, Ecclesfield District.

Mr. J. C. H. Tucker

Mr. J. C. H. Tucker, grandson of the founder of J. H. Tucker & Co., Ltd., has been appointed general sales manager of the Midland Electric Manufacturing Co., Ltd. The resources of J. H. Tucker & Co. and their subsidiary, the Kersons Mfg. Co., Ltd., were merged with those of M.E.M. in 1955.

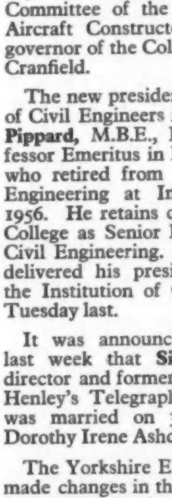
Mr. J. A. Gay has been appointed patents exploitation officer to the United Kingdom Atomic Energy Authority in succession to Mr. T. B. Gyles. Mr. Gay was formerly in the Commercial Department of the Authority's Industrial Group. He was appointed development engineer with Standard Telephones & Cables, Ltd., in 1949 and in 1951 joined Messrs. O. W. Roskill, industrial consultants, as senior engineer. From 1953 until 1956 he was with Isotope Developments, Ltd., and in 1956 joined the U.K.A.E.A. staff at Risley.

Mr. J. Pepper

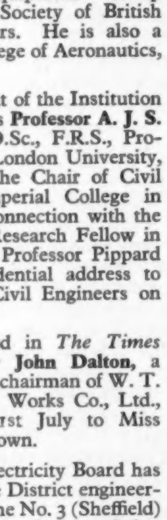
Mr. J. Pepper retired from the position of establishment officer to the East Midlands Electricity Board on 31st October. Mr. Pepper joined the staff of the Nottingham Town Clerk's Department in 1911 and remained there until 1948 when he took up his appointment with the East Midlands Electricity Board. In addition to his duties in this capacity he has also acted as the Board's representative on all local advisory, staff and works committees in the East Midlands Area. Throughout his career Mr. Pepper has taken great interest in the work of the National and Local Government Officers' Association, and was president in 1956-57.

Mr. J. G. Park, M.I.E.E., who in 1955 was appointed by the Commonwealth Relations Office as an electrical engineering adviser to the Government of Ceylon, under the Technical Cooperation Scheme of the Colombo Plan, left Ceylon last month to return to this country on completion of his term of service.

Mr. A. H. Shotter, A.M.I.E.E., who has held a senior position in the Surrey Suburban District of the London Electricity Board, retired on 26th October after fifty-one years' service in the electricity supply industry. Mr. Shotter was educated at St. Mary's Church School, Merton, and received his technical education at Wimbledon Technical College. After serving an apprenticeship with Foote & Milne, Ltd., he joined the Kent Electric Power Co., Ltd., and served in the generating station and substations

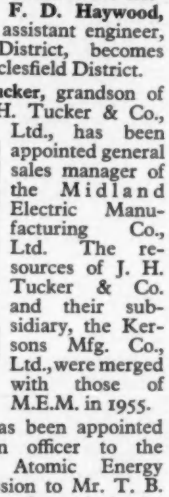


Mr. W. C. Smith

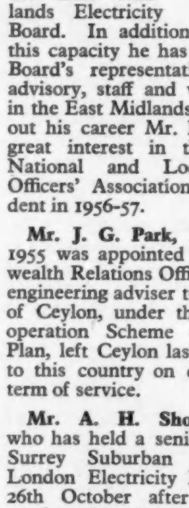


Mr. R. G. Hancock

Mr. T. P. Milburn



Mr. P. S. Parton



Mr. B. F. D. Haywood

Mr. F. Johnson

Mr. V. P. Marciandi

Mr. A. S. Oldhams

Mr. C. Reynolds

Mr. H. K. Tomkins

Mr. A. H. Edney

at Rochester and Chatham. In 1913 he joined the Wimbledon Electricity Department, but left to serve with the London Electrical Engineers during the 1914-18 war. After the war and until nationalisation in 1948 he served in various capacities at Wimbledon and was, in 1946, appointed deputy chief engineer and manager. Upon nationalisation he served with the London Electricity Board firstly in the South Western Sub-Area and since 1953 in the Surrey Suburban District.

Mr. L. C. W. Turner has resigned his directorships with the Brush Electrical Engineering Co., Ltd., and Brush Export (India), Ltd., members of the Hawker Siddeley Group, with effect from 31st December next, in order to take up an appointment as director and general manager of Aircraft Marine Products (Great Britain), Ltd. Mr. Turner joined the Brush Co. in 1954 as sales director from Crompton Parkinson, Ltd., where he undertook his early training and with whom, in the post-war years, he occupied senior posts. He takes up his new duties with Aircraft Marine Products as from 1st January next and will be operating from the head office at 60, Kingley Street, Regent Street, London, W.1.

Mr. L. C. W. Turner

Metal Porcelains, Ltd., has announced the following appointments to the board: **Mr. J. Semple** becomes managing director, **Mr. G. A. Greenwell** technical director, and **Mr. L. A. Read** works director.

Mr. J. P. Montgomery, assistant chief commercial officer, Midlands Electricity Board, has been appointed founder chairman of the new South Staffordshire Branch of the Incorporated Sales Managers' Association. The inaugural dinner of the Branch was held in Wolverhampton on 22nd October and was attended by the Mayor of Wolverhampton (Councillor Homer), Sir Geoffrey Mander and Mr. A. Lucas (national chairman, I.S.M.A.).

Following the recent Radiation-Parnall merger, it has been decided to integrate the two sales forces at present promoting the sale of electrical appliances under the Jackson, Parnall and Thor trade marks. The Jackson Electric Stove Co., Ltd., has consequently become the Electrical Division of Radiation, Ltd., the senior executives being: **Mr. F. Johnson,** general home sales manager; **Mr. V. P. Marciandi,** general overseas sales manager; **Mr. A. S. Oldhams,** sales manager, Jackson domestic appliances; **Mr. C. Reynolds,** sales manager, Parnall domestic appliances; and **Mr. H. K. Tomkins,** sales manager, heavy duty equipment. The headquarters of the new company will be 255, North Circular Road, London, N.W.10, but orders for Jackson products should still be sent to Dallow Road, Luton, and, for Parnall products, to Yate, near Bristol. All advertising and publicity matters will be handled by the Publicity Department at 143, Sloane Street, London, S.W.1. **Mr. A. H. Edney** is the publicity manager of the division.

Mr. J. Harwood Fryer, A.C.A., has resigned from the board of Crompton Parkinson, Ltd. Mr. Fryer joined the Crompton Parkinson Group in 1926 and, after having been secretary since 1930, was made an executive director of the company in 1939. He was appointed managing director of Crompton Parkinson, Ltd., in 1946, a position he held until his retirement from executive duties in 1957.

Oldham & Son, Ltd., held their annual Motor Show dinner at the Connaught Rooms, London, on 30th October when Mr. S. J. Wrigglesworth, O.B.E. (deputy managing director)presided over a company of about 450. After dinner Mr. John Oldham, O.B.E., chairman, proposed the health of the guests and gave his customary review of conditions in industry. He called attention to the growing competition from the "Iron Curtain" countries which, he said, necessitated the closest co-operation of the English-speaking peoples. Mr. Oldham mentioned the improvement in the country's economic position during the past year and stressed the part which each individual must play in maintaining it.

Mr. E. V. Smith, D.S.O., D.F.C., A.F.C., responded for the guests and gave the toast of the company, to which Mr. Edward C. Oldham, joint managing director, responded. After the speeches there was an excellent cabaret.

The Eastern Electricity Board has appointed **Mr. R. C. W. Lester,** M.I.E.E., planning and development engineer in the Chilterns Sub-Area, to be manager of the Hemel Hempstead District in the place of **Mr. W. M. Bishop,** who was recently appointed sub-area commercial officer for the Chilterns.

Mr. Lester was educated at the Watford Grammar School and obtained his technical training at the London Polytechnic. He was an articled pupil with the Watford Corporation Electricity Department and after holding various appointments in this undertaking he became the deputy mains superintendent. Shortly after vesting day he was appointed planning and development engineer for the Chilterns Sub-Area of the E.E.B.

Mr. R. C. W. Lester

At the annual Motor Show dinner of Oldham & Son, Ltd. Left to right: Sir Charles Henderson (a director of Oldham's French company), Mr. John Oldham (chairman), Mr. S. J. Wrigglesworth and Mr. E. C. Oldham (joint managing director)

The North Eastern Electricity Board announces that following the retirement of **Mr. E. G. F. Swangren,** M.I.E.E., **Mr. E. A. Sims,** A.M.I.E.E., has been appointed assistant chief engineer, operation and maintenance. Mr. Sims served his apprenticeship with the North Metropolitan Electric Power Supply Co., Ltd., and joined the North Eastern Electric Supply Co., Ltd., as a junior engineer. At the outbreak of the last war he was commissioned into the R.N.V.R. and later promoted to lieutenant-commander. On demobilisation he returned to the North Eastern Co. and up to 1948 held various engineering appointments at the districts and headquarters. During the early years of the North Eastern Electricity Board's existence he was assistant to the sub-area liaison officer and later was appointed as a senior assistant engineer in the Chief Engineer's Department.

Mr. E. A. Sims

Mr. A. J. Colgan

Mr. A. J. Colgan, M.I.E.E., assistant chief engineer (meters and testing) of the North Eastern Electricity Board, has been appointed assistant chief engineer (technical). Mr. Colgan received his early training in the Testing Department of the North Eastern Electric Supply Co., Ltd., in which department he held several appointments. In 1948 he was appointed personal assistant to the chief engineer of the North Eastern Board and in 1952 he became head of the meters section.

In our last issue we reported the appointment of **Mr. E. Broughton,** A.M.I.E.E., as manager of the Rhondda District of the South Wales Electricity Board. We have since received his portrait which we now reproduce.

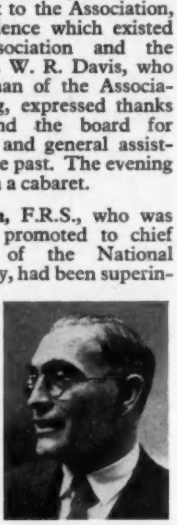
Mr. E. Broughton

Mr. G. C. R. Eley, C.B.E., has joined the board of the British Oxygen Co., Ltd.

The following members of the staff of Wolf Electric Tools, Ltd., have been elected to the board of directors as from 1st October last:—**Mr. N. McCann** (secretary and director) who joined the company as an accountant in 1935 and was appointed company secretary in 1945; **Mr. R. G. J. Nisbet** (director of Canadian operations) who joined the company as a sales representative for Scotland in 1935 and was appointed home sales manager in 1941, becoming general manager of Toronto branch in 1952; **Mr. J. A. Jackson** (works director) who joined the company as works manager in 1943; and **Mr. W. N. Scottorn** (sales director) who has been with the company since 1946 as manager of the Leeds branch and was appointed home sales manager in 1952.

The **J. & P. Foremen's Association** held its annual dinner at the Works Hall, Fairthorne Road, Charlton, S.E.7, on 24th October. Mr. W. Glass, chairman of Johnson & Phillips, Ltd., in proposing the toast to the Association, stressed the confidence which existed between the Association and the management. Mr. W. R. Davis, who is the new chairman of the Association, in responding, expressed thanks to Mr. Glass and the board for their good wishes and general assistance provided in the past. The evening was concluded with a cabaret.

Dr. N. P. Allen, F.R.S., who was recently specially promoted to chief scientific officer of the National Physical Laboratory, had been superintendent of the Metallurgy Division of the N.P.L. since 1944. Previously he had been a lecturer at Birmingham University, where he obtained the degree of D.Sc. in 1934, and a research metallurgist with the Mond Nickel Co., Ltd., where he made important contributions to the study of alloy steels and to the development of creep-resistant alloys for gas turbines. At the National Physical Laboratory he has been responsible for work on the metallography of uranium, the brittle fracture of exceptionally pure iron and the influence of additions upon it, the development of improved materials for steam power plant and the processes taking place during the fatigue and creep of metals. He has been interested in the metallography of the newer metals such as titanium and niobium, and in the application of radioactive tracers, electron microscopy and soft X-ray spectroscopy to metallurgical problems. He became a Fellow of the Royal Society in 1956.



Dr. N. P. Allen

The Minister of Power has appointed **Mr. E. R. Lewis,** of Knightsbridge, London, as a part-time member of the London Electricity Board.

The Central Electricity Generating Board has appointed **Mr. W. M. Tulip,** B.Sc., M.I.Mech.E., as regional secretary of the North Eastern and Yorkshire Region. Mr. Tulip received his technical training at Armstrong (now King's) College, Newcastle-upon-Tyne, and after graduating in 1924 he held appointments with Lambton, Hetton & Joicey Collieries, Ltd., and Clarke, Chapman & Co., Ltd. He then joined the North Eastern (then Newcastle-on-Tyne) Electric Supply Co. and was with that company until 1948 when he was appointed divisional secretary of the North Eastern Division, the post he now relinquishes. On taking up his new appointment he will operate from the regional headquarters in Leeds.

Mr. W. M. Tulip

Mr. T. A. G. Madden, B.Sc.Tech., M.I.Mech.E., M.I.E.E., has been appointed production, inspection and test engineer of the C.E.G.B. Mr. Madden received his technical education at the Portsmouth Municipal Technical College and in the Faculty of Technology of Manchester University. He served an apprenticeship at the Ribble power station, Preston, and later held various positions with International Combustion, Ltd., Derby. He was then successively with the Norwich Electricity Department and the Liverpool Electric Supply Department. From 1948 to 1952 he held the position of construction engineer with the Merseyside and North Wales Division of the then British Electricity Authority, and in 1952 he was appointed the co-ordinating engineer (generation construction) at the Board's headquarters in London, which post he now relinquishes to take up his new duties.

Mr. R. Farrall, M.I.E.E., has been appointed services engineer of the Central Electricity Generating Board. He commenced his engineering career in 1927 with Standard Telephones & Cables, Ltd., and in 1929 joined the Substation Engineer's Department of the London Electric Railway Co.—which later became part of the London Passenger Transport Board. Whilst with L.P.T.B. he was concerned with many aspects of the design, construction, operation, and maintenance of power stations and substations, in the course of which he occupied various posts including that of testing superintendent for a number of years. In 1947 he joined the Directorate of Power Station Equipment, Ministry of Supply, and in 1949 joined the

Mr. R. Farrall

Production, Inspection and Test Branch of the British Electricity Authority which took over this function. In 1950 he was appointed principal assistant engineer and in 1953 production, inspection and test engineer, which post he relinquished to take up the appointment of services engineer in June last.

The General Electric Co., Ltd., announces the appointment in its home sales organisation of **Mr. E. A. Fowler**, M.I.E.E., F.I.E.S., as general manager, Northern England, as from 1st November. Mr. Fowler will have overall responsibility for the present north-west area and the present north-east area of the home sales organisation. He will take up his appointment at Magnet House, Victoria Bridge, Manchester. **Mr. E. G. Taylor,** B.Sc. (Eng.), M.I.E.E., formerly assistant district manager, north-west area, has been appointed manager. He will continue to be based in Manchester, and will control Manchester, Liverpool and the Blackburn/Preston branches.

Since joining the G.E.C. in 1955, Mr. Fowler has been closely associated with reorganisation work and commercial administration at the head office. Before this he was chief commercial officer of the Eastern Electricity Board from 1949, having previously served as a member of the managerial executive of the Yorkshire Electric Power Co. from 1938. While with the Eastern Board Mr. Fowler served for several years on the Union Internationale des Producteurs et Distributeurs d'Energie Electrique Utilisation Committee as a representative delegate for the British Electricity Authority. He submitted a paper at the Rome Conference of U.N.I.P.E.D.E. in 1952 entitled "The Evolution and Development of Domestic Electrical Appliances" and in 1955 he submitted a further paper to the same Conference in London on "The Commercial Organisation of Electricity Supply in Great Britain." Mr. Fowler has served for many years on committees of E.D.A. He was vice-chairman of the North Midlands Centre of the Institution of Electrical Engineers in 1947-48.

Mr. E. A. Fowler

Mr. E. G. Taylor

Mr. Taylor is a graduate of Birmingham University and began his career with the G.E.C. as an apprentice at the Witton Engineering Works, later spending twelve months in the Estimating and Contracts Departments, Witton. From 1922 to 1924 he was technical assistant at the company's Liverpool office and then branch engineer at Swansea until 1930 when he was made branch engineer, Liverpool. In 1939 he was appointed branch engineer to Manchester as well as Liverpool and in 1945 became manager of the Industrial Sales Department at the Manchester branch. He was appointed assistant district manager, north-west area, in 1954. Mr. Taylor was a member of the Anglo-American Materials Handling Productivity Team (autumn, 1949). He served on the I.E.E. Council from 1941 to 1944 and was chairman of the Mersey and North Wales Centre of the Institution for 1941-42.

On Monday last **The Lightmongers** held their annual dinner at the Connaught Rooms, London, when about a hundred members and guests were present. The toast of the Society was proposed by Mr. W. J. Jones, who, in the course of some reminiscences, referred to his association with Mr. "Bill" Bush and Dr. Luckiesh (U.S.A.). Mr. Max Millar, past-president, replied to the toast and said that the Lightmongers now had a membership, after five years' existence, of 94.

Mr. J. G. Christopher proposed the health of the guests and Mr. J. H. Campion responded. Mr. J. E. Lane proposed the toast to the president, Mr. S. Anderson, and in replying Mr. Anderson reviewed the Society's activities and thanked Messrs. R. Stevens, C. Dykes-Brown, J. E. Lane and V. G. E. Gardner for their support during his year of office. He presented a cheque for £30 for the E.I.B.A. funds to Mr. P. E. Tayler and then installed Mr. Lane as his successor. Mr. Lane thanked the members for his election, and Mr. L. Tearle, a guest from South Africa, made some brief remarks.

Mr. G. F. W. Adler, B.Sc.(Eng.), D.I.C., A.M.I.Mech.E., has been appointed chief mechanical engineer and a member of the directorate of engineering of Marconi's Wireless Telegraph Co., Ltd., with responsibility for all mechanical engineering design aspects, both of the Marconi Co. and its associated company, Scanners, Ltd. He has joined Marconi's from the English Electric Co., Ltd., Rugby, where he held the position of chief development engineer.

Mr. G. F. W. Adler

Mr. Adler joined the English Electric Co. in 1945 as a graduate apprentice. In 1947 he was granted a bursary in hydro-power engineering at Imperial College, London. On the completion of his studies at Imperial College he returned to the English Electric Co. in the Water Turbine Department at Rugby, and was appointed successively design engineer, design production liaison engineer and chief mechanical development engineer. He became chief development engineer of the Rugby and Whetstone works in 1956.

Mr. A. W. A. Dick-Cleland, B.Sc., A.R.T.C., M.I.E.E., F.B.I.M., who recently relinquished his appointment as joint managing director of Lancashire Dynamo & Crypto, Ltd., has been appointed a director of the Brush Electrical Engineering Co., Ltd., and manager of its Rotating Machines Division at Loughborough. Mr. Dick-Cleland was educated at Kelvinside Academy and at the Royal Technical College, Glasgow. He has been associated with Fraser & Borthwick, the Harland Engineering Co. and the General Electric Co., Ltd., Witton. In 1933 he became Scottish manager of Newman Industries, Ltd., Partridge Wilson & Co., Ltd., and Tungstone Products, Ltd. He joined the Lancashire Dynamo Co. in 1946, becoming general manager in 1947, a director in 1949, and joint managing director in 1951. He was also a director of Lancashire Dynamo (Holdings), Ltd., the parent company.

Mr. A. W. A. Dick-Cleland

London Transport announces the following staff changes in the department of the chief electrical engineer:—

Mr. W. Ward, M.Inst.F., generating station superintendent (Greenwich), has been appointed generating station superintendent (Lots Road). Mr. Ward entered the service of the Metropolitan Railway in 1918 and was appointed assistant generating station superintendent (Lots Road) in 1950 and generating station superintendent (Neasden) in the following year. He became generating station superintendent (Greenwich) in 1954.

Mr. G. F. Withers, M.Inst.F., generating station superintendent (Neasden), has been appointed generating station superintendent (Greenwich). He joined the London Electric Railway Co. in 1928 as a combustion engineer at Lots Road station and was appointed assistant generating station superintendent (Lots Road) in 1951 and generating station superintendent (Neasden) in 1954.

Mr. E. Hibbett, M.Inst.F., assistant generating station superintendent (Lots Road), has been appointed generating station superintendent (Neasden) with the rank of principal executive assistant. He joined the London Electric Railway Company in 1928 as a combustion engineer at Lots Road station and was appointed assistant generating station superintendent (Lots Road) in 1950.

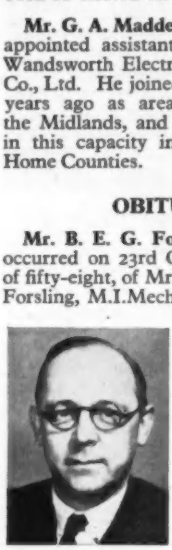
Mr. G. W. Moore, chief electrical and mechanical engineer, Directorate General of Municipalities, Ministry of Interior, Baghdad, Iraq, has now returned to this country. His address is c/o Lloyds Bank, Sidcup, Kent.

Mr. J. W. Plowman (Dewrance & Co., Ltd.) has been re-elected chairman of the British Valve Manufacturers' Association for the year 1958-59, and **Mr. N. P. Newman** (Newman, Hender & Co., Ltd.) has been re-elected vice-chairman.

Mr. G. A. Madden, M.B.E., has been appointed assistant sales manager of Wandsworth Electrical Manufacturing Co., Ltd. He joined the company nine years ago as area representative in the Midlands, and latterly has served in this capacity in London and the Home Counties.

OBITUARY

Mr. B. E. G. Forsling.—The death occurred on 23rd October, at the age of fifty-eight, of Mr. Bengt Erik Gustaf Forsling, M.I.Mech.E., M.I.Mar.E., at his home, 112, Ashlawn Road, Rugby. For the last eight years Mr. Forsling had been manager of the B.T.H. Gas Turbine Engineering Department at Rugby. He was born in Sweden and became a naturalised British subject in 1936. After graduating at the Technical University, Stockholm, in 1924 he joined A.B. Atlas-Diesel, Stockholm, and later was with A.B. Vaporackumulator, Stockholm. Two years later he came to London to take charge of the Calculating (Technical) Department and act as consultant to the Engineering Department of the Ruths Steam Storage Co., Ltd.



The late Mr. B. E. G. Forsling

Mr. Forsling joined the B.T.H. Turbine Engineering Department at Rugby under the late Mr. F. Samuelson in 1929, and was appointed manager of the Gas Turbine Engineering Department in 1950. His work included the design of two 2,500 kW gas turbines supplied to Nairobi a few years ago, and the design of the gas turbine propulsion plant installed in the Shell tanker "Auris"—the first ocean-going vessel to be so equipped. He was author of several technical articles and papers on gas turbines. Latterly he was concerned with the development of advanced design of steam turbines and of gas circulators for nuclear power stations, and since the recent formation of the A.E.I. Turbine-Generator Division his activities were extended to cover the whole range of its mechanical products. To enable him to do this he acted as chief engineer, Mechanical Development Department (Rugby), of the Division.

Sir William Halcrow.—The death occurred on 31st October, at the age of seventy-five, of Sir William (Thomson) Halcrow, the well-known civil engineer. Among the many works with which he was concerned were a number of important hydro-electric schemes, including the Lochaber (Scotland) undertaking, the Glen Affric and Caledonian schemes of the North of Scotland Hydro-Electric Board and the Kariba and Kafue projects in Rhodesia. Sir William also carried out much work for the London Underground Railways. He was the chairman of a committee reporting on the Severn Barrage proposal and also of the panel of engineers who designed the Mulberry Harbour during the war.

Sir William was a past chairman of the Association of Consulting Engineers and of the British Section of the Société des Ingénieurs Civils de France. He received his knighthood in 1944.

Mr. T. Golding.—The death occurred on 29th October of Mr. T. Golding, O.B.E., A.M.I.E.E., a director of W. H. Allen Sons & Co., Ltd., Bedford. Mr. Golding joined the company in 1910 as assistant in the Electrical Department and subsequently became electrical designer and, later, manager of the department, which position he held from 1923 to 1956. He was elected to the board in 1955 and after relinquishing his position of electrical manager, continued in his capacity as a director, acting as a consultant to the company. He also continued to sit on various technical committees concerned with the work of the electrical industry. Cremation took place at Bedford Crematorium on 1st November, and a memorial service was held at St. Peter's Church, Bedford, on 3rd November.

Mr. T. G. Symonds Babb, formerly chief mechanical and electrical engineer, Air Ministry, died on 24th October at the age of seventy-three. Mr. Babb served in the 1914-18 war in the Royal Engineers and the R.F.C. He joined the Air Ministry in 1920 and was chief mechanical and electrical engineer from 1943 to 1946. He was awarded the C.B.E. (Civil) in 1946.

Mr. W. Simon, general and works manager of Uni-Tubes, Ltd., died on 18th October. He joined the company eight years ago to take control of the factory at Slough.

Mrs. Emily Hulme, a director of F. Hulme & Co., Ltd., died on 26th October.

I.E.E. Dinner at Chester

On Monday last the Mersey and North Wales Centre of the Institution of Electrical Engineers held its annual dinner at the Grosvenor Hotel, Chester, under the chairmanship of Mr. John Collins (English Electric Co., Ltd.). After the loyal toast a toast to the Institution of Electrical Engineers was proposed by Dr. G. Ellison, Bishop of Chester. He said that it was interesting to compare conditions fifty years ago with those obtaining to-day. Then a clergyman would have been suspect should he have gone readily and easily in the company of scientists. Indeed it was one of the most regrettable but nevertheless recognisable factors of the last hundred years that there was a breach between those who professed religion and those who called themselves scientists. Dr. Ellison believed that scientific men were coming to realise the impact which religion could have upon what they were doing just as religious men were proud and humble to learn from the enormous achievements of the scientists.

The response was by Mr. A. H. Mumford, vice-president, I.E.E. Referring to the specialised sections, he said that they were independent and yet mutually dependent. There was no question of a rigid barrier and their strength came from their mutual association. A toast to the guests was proposed by Mr. T. Makin, past-chairman of the Centre, and Mr. E. B. Banks, chief commercial manager, English Electric Co., Ltd., replied.

At the I.E.E. Chester dinner. Left to right: Mr. A. H. Mumford, the Bishop of Chester, Mr. J. Collins (chairman), and Mr. E. B. Banks

LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication.
Responsibility cannot be accepted for the opinions expressed by correspondents.

Building Construction and Space Heating

I WAS pleased to read Mr. Osborne's comments on my article, in view of the rather conservative attitude of the building industry regarding thermal insulation. The present disregard for thermal insulation in domestic building is undeniable. Many houses of to-day have little better than single-brick insulation, especially local authority houses, yet many of these are to architects' designs.

Mr. Osborne seems not to have appreciated that my article was intended to illustrate an economical method of achieving good thermal insulation. It is not necessarily the best, but as the extra cost was only 1·5 per cent of the total cost, I doubt whether Mr. Osborne could do better.

My article stressed that it was based on local information, and the practice of rendering is common in this area. He further implies that rendering is not in general use, but, in my experience, it is used to varying extents in most parts of the country; casual observation will verify this. While facing brickwork may be more usual in the higher class, minority type of building, even here it is increasingly combined with rendered areas for effect. Table 1 of my article includes the cost of rendering.

I would also like to correct two misleading statements made by Mr. Osborne concerning hollow clay blocks. Hollow clay facing blocks are available, and so, contrary to Mr. Osborne's belief, rendering is not essential. These are relatively new and their present limited use may be attributable to the conservatism mentioned above. My figure of "U"=0·16 is the figure given by the actual makers of the block and is a calculated value which accords with experimental results as yet unpublished. They have no knowledge of the figures quoted by Mr. Osborne.

Obviously, a wet site will reduce the insulation value of any form of floor slab, but the effect of fibreglass will still be appreciable, especially in view of the drying effect of the heated floor slab.

I heartily agree that some things are far from obvious, and comments are very welcome, but I cannot help wishing that Mr. Osborne's criticism had been more accurate and constructive, in view of the importance of the problem. Whether or not my personal opinions are too optimistic is slowly being settled by the running costs of this all-electric bungalow. These are at present favourably close to my original design calculations. Surely this is realism, not optimism.

Buckfast, S. Devon. R. I. ELLARBY.

Advanced Gas-Cooled Reactor

Contracts Let and Work Started at Windscale

IN the fourth annual report of the United Kingdom Atomic Energy Authority reference was made to a prototype advanced gas-cooled reactor (AGR). It was then stated that the planning of this project began in September, 1957, the object being the design and construction and operation of a dioxide-cooled, graphite-moderated reactor experiment operating at a temperature intermediate between the improved Calder Hall type and the high-temperature gas-cooled reactor system. The intention was then to use uranium oxide in beryllium cans but with the reactor designed to allow alternative forms of fuel to be tested on a large scale.

Further details of this reactor were given in a paper by Mr. R. V. Moore delivered at the Geneva Conference and mentioned in our issue of 19th September. A diagram of the reactor was also reproduced in that issue on page 538. In a lecture given at Madrid on 22nd October, Sir John Cockcroft said that this prototype reactor is now being built at Windscale.

The use of the beryllium fuel can should enable the surface fuel temperature to be run at 600 deg C, that is, about 200 deg above Calder Hall values. The experimental reactor will develop about 100 MW thermal and 28 MW electrical. A single pressure steam cycle will be used with steam at 600 p.s.i. It is hoped that this reactor will become the prototype for nuclear power stations to be ordered from about 1962. If the reactor is also developed for use in ships, it is understood that it would be suitable for large vessels and not for use in submarines.

Contracts for this work have now been let and the main contractors are:—Reactor vessel, Whessoe, Ltd.; turbo-alternator, English Electric Co., Ltd.; heat exchanger, International Combustion, Ltd.; containment building, Babcock & Wilcox, Ltd.; dump condenser, Hick, Hargreaves & Co., Ltd.; feed pumps, Mather & Platt, Ltd.; building and civil works, Whatlings, Ltd.

Ewbank & Partners, Ltd., have been retained as consulting engineers on the turbo-alternator and that part of the steam plant in the turbine hall.

"Clean the Air"

Organisations representing the electricity, gas and solid fuel industries are showing different methods of implementing the provisions of the Clean Air Act at the Royal Society of Health's exhibition "Clean the Air" which was opened by Lord Mills, Minister of Power, on Monday. The exhibition, held at the Society's centre at 90, Buckingham Palace Road, London, remains open till 14th November. The British Electrical Development Association's exhibit "brings to life" the new E.D.A. publication for local authorities "Nuclear Power to Clear the Air," and shows the many applications of electricity in existing and new houses and flats, in schools, offices and public buildings. The six display units can be borrowed, singly or together, by Electricity Boards and local authorities. At the electrical day on Wednesday, six showings of the new E.D.A. film "The Future is Electric" were made to specially invited audiences.

PARLIAMENTARY REPORT

BRITAIN'S continued prosperity, said the Prime Minister when he reviewed the Government's programme for the new session of Parliament in the Commons last week, depended on our ability to develop and use to the full the brains and skill of the people, and the adjustment and change of industry to new conditions. "That is why we regard education as the most fundamental productive investment we can make," he continued. There would be a large building programme for the expansion of the universities, particularly in the teaching of science and technology. In technical education most of the new buildings included in the £80 million five-year programme had been started; the number of sandwich classes had been doubled; and the first diplomas in technology had already been awarded. The Minister of Education would soon be presenting to the House in a White Paper details of an ambitious five-year plan to improve and develop the secondary schools without, of course, destroying the grammar schools.

The Queen's Speech, giving the Government's programme for the new session of Parliament, pledged the Government to seek to expand Britain's overseas trade both in Europe, by the creation of a Free Trade Area, and throughout the world. Further help was to be given to small farmers to modernise their farms and make them more efficient. Legislation would also be introduced to establish a modern code for the general regulation of building in Scotland.

Investment Restrictions Lifted

Restrictions which the Government placed on investment in the electricity generating industry during the sterling crisis in September, 1957, have now been lifted, the Chancellor of the Exchequer, Mr. Heathcoat Amory, announced in the House of Commons on Monday. It will be remembered that at the time Mr. Peter Thorneycroft was Chancellor he declared that investment in the public sector in 1958-59 and 1959-60 would not be allowed to exceed the total for 1957-58, which he put at £1,500 million. In fact, the total for that year worked out at about £1,450 million.

Mr. Heathcoat Amory told the Commons that much of the investment in the public sector was on long-term projects. These could not efficiently be interrupted when once begun, and during the summer a review had been carried out to see what investment would be possible in view of the changing circumstances of the economy. The Government decided that public investment could be allowed to rise somewhat.

A series of specific relaxations, designed to stimulate an improvement in industrial activity during the coming winter, particularly in those areas suffering from the most unemployment, were put into operation. Most of these were now under way. As a result he expected that by the end of this year the rate of public investment would be running appreciably above that of last year. For next year he expected a level of public sector investment of the order of £125 million to £150 million higher than last year. This should be sufficient to offset any fall which was at all probable in private fixed investment.

Public sector expenditure had two consequences. The first task must be to ensure that enough resources were devoted to the productive public investment needed to support industrial expansion—investment in electrical power, the railways and the roads. The Government were therefore providing considerable investments under these heads—a large increase over last year both in absolute and in percentage terms.

Insurance Against Nuclear Accidents

Fulfilling a promise made by the Government in February, the Minister of Power, Lord Mills, introduced in the House of Lords last week the Nuclear Installations (Licensing and Insurance) Bill, under which the construction and operation of a nuclear reactor will require a licence from the Minister of Power (in Scotland the Secretary of State) who may impose such conditions as he thinks necessary for safety.

Every licensee will be liable to pay compensation for such damage to property or personal injury from radioactive contamination even if it is due to an unavoidable accident, except to the extent that the claimant has been guilty of contributory negligence. The licensee will be required to insure his liability or show that he is holding adequate liquid assets. The liability is, however, to be limited in effect to £5 million in respect of any one incident. It is not believed that there is any real danger of damage up to anything like this figure (the cost of the damage following the Windscale accident was less than £100,000). In the highly unlikely event of an incident causing more than £5 million worth of damage, special measures would be needed. Therefore if the Minister considers that the claims arising from any one incident are likely to exceed £5 million, he will have to certify accordingly and thereupon no claims will be dealt with until Parliament so determines.

Since certain types of injury from radiation may not become manifest for a long time the Bill provides that actions for damages may be instituted up to ten years after the time when the radiations giving rise to the injury were emitted.

New Factories Bill

One of the first new Bills to be published was the Factories Bill, the first new piece of legislation dealing with working conditions in factories to be laid before the House for ten years. It has three main objects—to improve the existing provisions with regard to the prevention and fighting of fires; to revoke Defence Regulation 59 and replace it with a more limited power to grant exemptions from the law regulating the hours of employment of women and young persons; and to place on the Minister the duty of promoting health, safety and welfare under the Factories Acts by means of collecting and disseminating information and by carrying out and assisting in the carrying out of investigations.

The Bill makes three main changes in the penalty provisions of the Factories Act, 1937: The maximum fines for various contraventions are doubled; the additional fine which can be imposed where a contravention results in injury or death is abolished and in its place the Bill provides that Courts may impose a higher maximum fine for a contravention likely to cause death or bodily injury to any person; and the Bill abolishes the provision under which the Minister can award part of a fine imposed for a contravention in which a person is killed or injured to that person or to his family. These changes are in line with the provisions of the Mines and Quarries Act, 1954.

PRICES OF MATERIALS

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM ingots	ton £180 0s 0d
COPPER, H.C. Electro	ton £253 0s 0d
Fire Refined 99·70%	ton £252 0s 0d
Fire Refined 99·50%	ton £251 0s 0d
COPPER Tubes ..	lb 2s 5⅞d
Sheet	ton £289 0s 0d
H.C. wire and strip ..	ton £303 5s 0d
LEAD, English ..	ton £74 5s 0d
Foreign	ton £73 0s 0d
MERCURY	flask £78 0s 0d
TIN, block (English) ..	ton £748 10s 0d
ZINC, G.O.B. Foreign	ton £73 10s 0d
BRASS Tubes (solid drawn)	lb 2s 0d
Wire	lb 2s 9⅜d
PHOSPHOR BRONZE Wire	lb 4s 3¼d
PLATINUM	oz £21 5s 0d
RUBBER, No. 1 R.S.S. spot	lb 25⅞d—26d

INDUSTRIAL NEWS

The Commonwealth and Europe

The results of "A Survey of Commonwealth Parliamentary Opinion on British Participation in a Free Trade Area" will be welcomed by those who believe that the United Kingdom can best serve the Commonwealth by strengthening its economy in a Free Trade Area. No less than 72 per cent of the 182 M.P.s of overseas Commonwealth countries who replied to the questionnaire were in favour of British membership of the F.T.A., and most of those who were against stated that they would change their views if certain conditions were satisfied, particularly in relation to the supply of European capital and to guaranteed markets for Commonwealth exports to the U.K. and the Continent. The small number of M.P.s who responded (11 per cent) would seem to indicate a lack of strong feelings on this subject.

There was a difference of opinion on the effect on primary producing countries, but those who considered that U.K. participation in the F.T.A. would be a disadvantage were in a majority. On the political side, 83 per cent favoured closer ties between the U.K. and the Continent and a third favoured full participation in a United States of Europe. The Survey can be obtained from Federal Union, 10, Wyndham Place, London, W.1, price 5s post free.

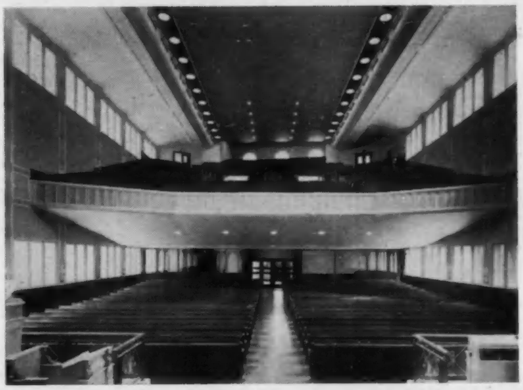
Electrical Engineers' Exhibition

Mr. P. A. Thorogood, general manager of the Electrical Engineers' Exhibition, tells us that there has been a majority decision of exhibitors against the opening of the exhibition to foreign concerns in 1960. He suggests that exhibitors may wish to discuss the matter further at the exhibitors' meeting after the 1959 display.

A list of exhibitors as at 29th September contains the names of about 400 firms.

City Temple Installation

On Thursday last week Queen Elizabeth the Queen Mother attended a service of re-dedication of the City Temple, which was bombed during the war. The church was redesigned by Messrs. Seely & Paget. The electrical contract was carried out by Troughton & Young, Ltd., and included the electrical installation for the main church, the meeting room below it, which has a fitted stage, and sundry offices and meeting rooms. The whole of the lighting installation was planned by Troughton & Young (Lighting), Ltd., in co-operation with the architects, and has a number of unusual features. The lighting in the church is solely by means of fittings recessed into the roof with access above, housing 500 W lamps. These fittings were supplied by Troughton & Young (Lighting), Ltd. The cross, which is made of cedar of Lebanon, is illuminated from behind by fluorescent lamps. The lighting of the hall below is by special fittings consisting alternately of fluorescent and tungsten lamps in triangular section fittings to fit in the space between the wall and the ceiling. The tungsten lighting (2×150 W per section) is for normal lecture and theatrical use, but for high level lighting additional fluorescent lighting (3×4ft 40 W per section) is available.



The City Temple in which the electrical installation was carried out by Troughton & Young, Ltd.

Cablemaking Industry Wages

The Joint Industrial Council for the Electrical Cablemaking Industry has agreed to increases in wage rates in the industry. Timeworkers' rates for adult male employees have been increased by 1¾d an hour (6s 5d a week) in classifications Nos. 1 and 2, and by 2d an hour (7s 4d a week) in classifications 3 to 6. The rates for adult female employees have been raised by 1½d an hour (5s 6d a week). Under the new scales, the rates of pay per week for adult males in District No. 1 will range from 159s 6d in classification 1, to 178s 9d in classification 6, and in District No. 2, from 156s 9d in classification 1 to 176s in classification 6. The new weekly rates for adult females range from 121s in classification No. 1, to 128s 4d in classification No. 3. Proportionate increases have been made in the rates for boys and youths and girls below adult age. The increases came into force as from the beginning of the first full pay period commencing on or after 1st October.

Electricity and the Clean Air Act

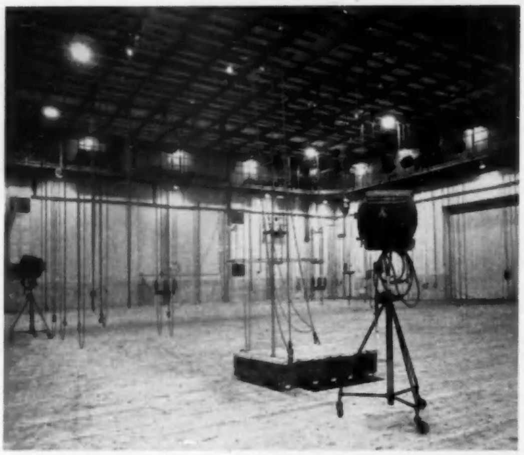
Electricity has a large part to play in the national campaign to clear the atmosphere of smoke and smog. How the electricity supply industry can assist is fully set out in the latest publication of the Electrical Development Association, "Nuclear Power to Clear the Air," a 12-page illustrated booklet which has been specially prepared for the information of members and officials of local authorities. There are three main sections to the brochure dealing respectively with the installation of electricity in existing houses, new houses and flats, and in offices, schools, libraries and baths. Copies can be obtained from electricity service centres or direct from the E.D.A., 2, Savoy Hill, London, W.C.2.

New Zealand Import Licensing

The New Zealand Import Licensing Schedule for 1959, published in last week's *Board of Trade Journal*, indicates for each item the basis on which allocations (if any) will be determined. The "A" category (covering goods for which licences were granted to the amount applied for) is abolished and most of the goods previously in this category are included in the higher categories in the new schedule. Among the few electrical goods for which the allocation is less than that covered by 1958 licences are switchboards and associated equipment, insulated cable and wire, electric razors, domestic food mixers, pedestal hair dryers and certain types of electric lamps.

Film Studio Installation

A major reconstruction programme has recently taken place on the four main stages at Shepperton Studios. Until recently, it has been the practice to build lighting galleries for illuminating the sets up from the floor, by use of steel scaffolding. The number of arc lights arranged around a set, particularly for colour photography, is prodigious. This scaffolding, and associated cables leading to the lights, has tended to restrict the operational floor space. Therefore, when the four stages were rebuilt, it was decided to



Chain pulley blocks for the lighting gear at Shepperton Studios

suspend all the lighting gear from the roof by means of cradles attached to chain pulley blocks from the girders running across the roof. After the walls had been covered with sound insulation, the electrical contractors, Troughton & Young, Ltd., under the supervision of Mr. C. W. Hillyer, chief electrical engineer, British Lion Studios, reinstalled the electrical services. With a possible load of 36,000 A there is a total of 30,000ft of 6in by ½in aluminium busbars for the 240 V d.c. 3-wire system in the form of ring mains; 36 sub-breaker panels, each of 1,500 A capacity; 180 400 A take-off panels; complete red and green light systems; camera services; and a.c. and d.c. house services. The a.c. house services are distributed around the studio walls and include 15 A socket-outlets for construction services and 230 V 3-phase circuits for camera services; the d.c. services are for air conditioning.

A.C.E.C. Brochure

The Ateliers de Constructions de Charleroi has issued a well-illustrated booklet containing a historical survey of the company, in which it briefly describes the various stages of development from the year 1881. It records that the company now has five up-to-date plants in Belgium and seven abroad, and employs 16,000 workpeople. Particulars are given of production and research facilities and of some of the company's achievements.

Resistance Casting

A discovery in resistance welding, provisionally patented, is now being developed. This discovery, evolved directly from work done for the United Kingdom Atomic Energy Authority, was demonstrated recently at the open day of the British Welding Research Association, Abington, near Cambridge.

In spot welding, molten metal is expelled if the welding current is too high or if the electrode force is too low. This molten metal can be directed into a cavity in the welding face of an otherwise normal spot welding electrode. Since it freezes there to form a stud, strongly welded to the parent sheet, the technique is known as resistance casting, or sometimes as "stud raising" or "pimple welding."

Studs of highly varied shapes and sizes have been formed by this resistance casting process in a wide range of metals, including steel, stainless steel, light alloys, titanium, and nickel alloys. A peg of similar or different material, inserted in the electrode cavity, can be cast into the stud. If both electrodes are provided with a cavity, projections will be formed on both sides of the article. Amongst the possible industrial applications are the raising of projections on tubes or flat surfaces to form heat exchangers.

Multi-Rope Friction Winder

Two new multi-rope friction type electric winders have recently been commissioned in Nos. 2 and 3 shafts at Rufford Colliery in the East Midlands Division of the National Coal Board. The driving motors and associated equipment for each winder are duplicates of the other and this feature will be further extended in due course to embrace No. 1 shaft which at present is steam driven.

The installations now in service are the largest tower-mounted four-rope friction winders with directly coupled motors in this country and were supplied by Metropolitan-Vickers in association with Markham & Co., Ltd., who were responsible for the mechanical parts.

The winder for No. 3 shaft was the first to be commissioned, and is designed to raise 12 ton capacity skips in balance from a depth of 3,100ft at a maximum rope speed of 47·5 ft/sec and to give an output of 450 tons/hr. The No. 2 shaft winder has a double-deck cage and counterweight, and winds men, coal and material from the same designed depth and serves all levels. The cage has a payload of 12 tons or 100 men per wind. The normal rope speed is 49·25 ft/sec, but this can be increased to 55·4 ft/sec for winding coal at the rate of 280 tons/hr.

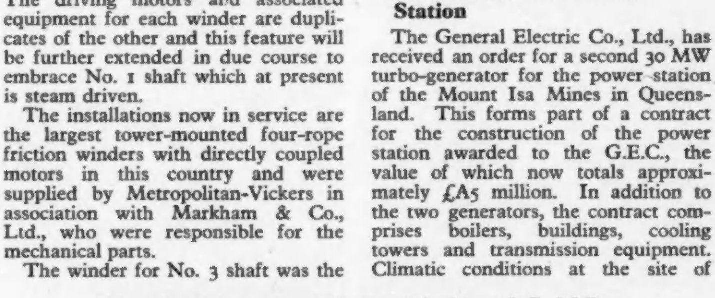
The friction drum of each winder has a diameter of 12ft and the four 1¼in locked coil ropes are independently attached to the conveyances for safety reasons. Each winder is driven by two overhung, d.c. motors, totalling 3,400 h.p., with shaftless hollow armatures coupled directly to the shaft flanges on each side of the friction drum.

A closed loop control system is used, in conjunction with a Ward-Leonard motor-generator set driven by a 2,740 h.p. 11 kV motor, which incorporates overriding acceleration, retardation, peak power demand and current limiting features. Control is exercised through a static phase shifter in the grid circuit of a six anode mercury arc rectifier for variable excitation of the generator shunt fields and, consequently, the motor armature voltage. A three anode mercury arc rectifier supplies a constant voltage for motor field excitation. Standby rectifiers are provided in each case. The winding cycles may be carried out automatically or under manual supervision.

Plant for Australian Power Station

The General Electric Co., Ltd., has received an order for a second 30 MW turbo-generator for the power station of the Mount Isa Mines in Queensland. This forms part of a contract for the construction of the power station awarded to the G.E.C., the value of which now totals approximately £A5 million. In addition to the two generators, the contract comprises boilers, buildings, cooling towers and transmission equipment. Climatic conditions at the site of

Metropolitan-Vickers multi-rope friction winder drive at Rufford Colliery



Mount Isa Mines have led to the adoption of a completely outdoor arrangement for the power station except for the air-conditioned control room. The generators are driven by single-casing turbines operating at 900 p.s.i.g., 850 deg F. The contract was obtained through the company's Australian organisation, British General Electric Co. Pty., Ltd., and will be carried out from the G.E.C. engineering works at Erith, Kent.

Lamp Publicity

The advertising and publicity of Philips Electrical, Ltd., for the 1958-59 lighting season will be concentrated on its "Bi-Pin" range of fluorescent lamps and fittings and "Reflectalite" fluorescent lamps. Space has been booked in a wide range of industrial journals. So far as tungsten lamps are concerned, the accent will be on the "Argenta" range and the high-lumen coiled-coil types. Press advertising, in more than 730 local papers directed at the domestic consumer, will be continued. The Philips lighting design service will be advertised in those publications which circulate in various branches of industry, the food and retail distributive trades, hotels and catering managements, etc. The supply of wire lamp merchandisers, with suitable price and descriptive cards, will also continue.

SMALLER LAMPS!
Serve yourself
with the NEW
PHILIPS
K TYPE LAMP
PHILIPS K TYPE LAMPS

The Philips "K" type lamp dispenser

A number of new sales aids are now available. These include an "Argenta" lamp showcard finished in blue, black and rose, measuring 10in by 14in, an "Argenta" lamp window streamer in blue and rose and "K" type lamp dispensers made of cardboard and measuring 14½in wide by 17¼in deep. They are printed in four colours. In use a 60 W "K" type lamp shows comparison of size with that of a conventional 60 W lamp. Two vertical containers for six 60 W and six 100 W lamps allow the customer to operate self-service. These items are available on application to Philips regional and branch offices. New colourful broadsheets, suitable for display in dealers' shops, are also available covering the "Bi-Pin" range of fluorescent fittings, fluorescent lamps and accessories. Another addition is a hanging price card for tungsten lamps. Leaflets have also been prepared covering the various types of lamps.

Batti-Wallahs' Society

The guest speaker at last week's luncheon of the Batti-Wallahs' Society was Sir Frederic C. Hooper, managing director of Schweppes, Ltd., who in an entertaining address on "The Romance of Schweppes" made some shrewd observations on management in industry and on sales promotion. He said that since the war too much attention had been given to industrial production and not sufficient on sales promotion, and he gave some interesting details of his company's methods of promoting sales. Mr. H. H. Spencer, the president, was in the chair, and a vote of thanks to Sir Frederic was proposed by Mr. J. W. Perkins (past president). Mr. T. C. F. Bigland (the "Mate") announced that the speaker at the next luncheon (on Thursday, 27th November) would be Sir Stephen Gibson.

New South Wales Switchgear Area Offices

South Wales Switchgear, Ltd., and Aberdare Cables, Ltd., have established new offices in Wilmslow to deal with activities in the North of England. Both companies have for many years had offices in Deansgate, Manchester, but in view of the heavy congestion and difficulty of finding sufficiently extensive premises in Manchester it was thought desirable to establish new offices in Wilmslow. The business conducted from the new suite of offices has been extended from purely sales and technical representation to cover the contract work for this part of the country. To this end a contracts office has been established together with all the necessary drawing office facilities and draughtsmen. The official opening of the new office block was performed by Mrs. A. J. Nicholas, wife of the managing director, South Wales Switchgear, Ltd., on 30th October, when representatives from the Central Electricity Generating Board, North Western Electricity Board, Merseyside and North Wales Electricity Board and the National Coal Board were present. The company was represented by Mr. J. P. Gilliver (joint managing director, Aberdare Holdings, Ltd.), Mr. A. J. Nicholas (managing director, South Wales Switchgear, Ltd.), Mr. H. A. Lamb (general manager, Aberdare Cables, Ltd.), Mr. C. A. Hutchinson (Aberdare Cables, Ltd.) and Mr. W. Harris (manager, north west area branch office). In conjunction with the official opening, an exhibition of switchgear, transformers and cables has been held during the whole of this week.

Mrs. A. J. Nicholas, wife of the managing director of South Wales Switchgear, Ltd., performing the opening ceremony of the north west area branch offices. On the left is Mr. J. P. Gilliver (joint managing director, Aberdare Holdings, Ltd.), and on the right, Mr. W. Harris (manager, northern area office)

British Lighting Council

In connection with the Council's Shop Lighting Campaign, the accompanying picture shows a display stand, designed and constructed by the North Western Electricity Board, which is

A shop lighting display which the North Western Electricity Board is showing at various exhibitions in its area

Consult us on your
SHOP LIGHTING PROBLEMS
-it will help to improve your business

using it to introduce the idea of shop lighting at various exhibitions in its area.

The demonstration rooms at 2, Savoy Hill, London, W.C.2, of the British Lighting Council are now closed, but otherwise work is proceeding normally. The reconstruction of the premises at 16-18, Lancaster Place, Strand, London, W.C.2, is nearing completion.

Crabtree Mobile Display Unit

A mobile display unit is now being employed by J. A. Crabtree & Co., Ltd., Walsall, and this has recently completed a tour of the West Country, the Midlands and the North of England, and Scotland. The vehicle, which carries a representative display of wiring accessories, miniature circuit-breakers and motor control gear, is intended to supplement the exhibitions which are held in various towns.

The new mobile display unit of J. A. Crabtree & Co., Ltd.

Motor Price Reductions

The General Electric Co., Ltd., announces appreciable price reductions in its ranges of squirrel cage motors up to approximately 50 h.p. which came into operation on 1st November.

Wiring for Gateshead Flats

The entire wiring cable supply for a new block of 160 flats at Ann Street, Gateshead, built by George Wimpey & Co., Ltd., for the Gateshead Corporation, was provided by Mersey Cable Works, Ltd. P.v.c. insulated cable was used. The Corporation's own electrical department was responsible for the wiring.

Electricity from Sewage Gas

Ten dual-fuel engine-driven generating sets—which will operate mainly on gas from the waste products of sewage—have been ordered from the English Electric Co., Ltd., by the London County Council for its Southern Outfall Works, a large new sewage plant, at Erith, Kent.

The sets will generate at 6,600 V, three-phase, 50 c/s with an output of 800 kW (1,000 kVA at 0·8 power factor). Each engine will have a normal rating of 1,136 b.h.p. at 428 r.p.m. The full load fuel consumption, as a "straight" diesel, will be 0·35 lb per b.h.p.-hr and 7,000 B.Th.U. per b.h.p.-hr when running as a dual-fuel unit.

The contract also includes an engine room control panel, from which the main switchboards can be controlled if necessary, and which will enable the operator to synchronise the sets with the incoming supply from the London Electricity Board. There will also be a control room indicator and instrument panel, with instruments showing gross temperature, water temperatures, effluent water temperatures, fuel oil tank capacities, etc. Two 300 kVA, 6,600/415 V transformers, a 32-panel, 250 MVA, 6,600 V switchboard with solenoid operated switchgear, and three 415 V distribution boards and change-over switches are included in the contract, with the necessary field suppression and neutral earthing cubicles.

Fluorescent Lamp Developments

The A.E.I. Lamp & Lighting Co., Ltd., has decided to market a complete range of universal fluorescent lamps. These lamps are now available in all sizes from 15 to 80 W and in all colours. They will operate on all normal circuits whether switch start or instant start. Prices and efficiencies remain the same as for "Mazda" switch start lamps.

The three alternative finishes—plain, external metal stripe or silicone—for all sizes and ratings of "Osram" tubes of the General Electric Co., Ltd., will be replaced by a standard external conducting stripe enabling the tubes to be used with switch and switchless starter circuits. The new tubes will be sold at the list price previously charged for switch start tubes.

Pope's Electric Lamp Co., Ltd., announces that its "Elasta" universal start tube now replaces three types of 5ft 80 W tubes—switch start, siliconed and metal finish. It is available at the same price as the present switch start type.

Atlas Lighting, Ltd., announces that the normal range of its quickstart graded tubes are now supplied at the same price as standard tubes in all sizes and colours. At the same time the extra cost for Atlas metal strip tubes in all sizes and colours has been reduced to 6d per tube (purchase tax 1½d extra).

Ekco - Ensign Electric, Ltd., announces that the extra charge for quickstart (sylcoated) tubes has been abolished, and this applies to the full range of standard "Ekco" fluorescent tubes. Instant start (metal strip) tubes will be reduced in price to 6d extra per tube plus 1½d purchase tax.

Specialised Publications

The Council of the Trade and Technical Press (Imperial House, Kingsway, London, W.C.2) has produced, and is circulating to a large number of interested people at home and overseas, a handsome 111-page guide entitled "Business and Specialised Publications of Great Britain." It is primarily concerned with trade and technical journals and for each of them an illustration of the front cover is given, with brief particulars of the nature of the contents, subscription and advertisement rates, etc. The same treatment is accorded a number of directories and annual publications. At the end there is a classification of publications by industries and subject matter and a form by means of which further information can be obtained.

Government Copper Stockpile

The Board of Trade announces that it is offering 10,000 tons of copper for delivery and pricing during the period mid-November, 1958, to the end of January, 1959. Some 8,000 tons of this copper will be offered to the original suppliers or their agents and the remainder by open tender. In addition, a small quantity of copper cakes is being released to consumers immediately. Application may be made to the Board of Trade, General Division 7, Lacon House, Theobalds Road, W.C.1, for tender forms.

Ottermill Switchgear Works

In our issue of 24th October we dealt with the recent extensions to the works of Ottermill Switchgear, Ltd., at Ottery St. Mary, Devon. By a slip we said that the fuse switches made by the company ranged from 60 to 100 A. Actually they are produced for currents up to 600 A.

Change of Address

From 1st December the address of the City and Guilds of London Institute will be 76, Portland Place, London, W.1 (telephone: Langham 3050).

Change of Name

The Newmarket Transistor Co., Ltd., has changed its name to Newmarket Transistors, Ltd.

Trade Announcements

The **A.E.I.-John Thompson Nuclear Energy Co., Ltd.,** has moved to 33, Grosvenor Place, London, S.W.1 (telephone: Belgravia 7011).

The address of the **Modern Equipment Co., Ltd.,** manufacturers of "Modeq" clothes dryers and convector heaters, has been changed to 21, Monmouth Street, Bridgwater, Somerset (telephone: Bridgwater 2410).

The **Nelson Engineering Co., Ltd.,** announces that by mutual agreement the appointment of Veritys, Ltd., as its sales representatives has now been terminated and it will in future conduct its own selling arrangements.

Airmec, Ltd., have been appointed sole agents in the United Kingdom for the Microlambda Co., of Italy, manufacturers of precision microwave measuring instruments and ancillary equipment.

Transistor Digital Computer

By R. C. M. BARNES, B.Sc.(Eng.), A.M.I.E.E., and J. H. STEPHEN, Ph.D., Graduate I.E.E

Authors' summary of the paper entitled "Operating Experience with a Transistor Digital Computer" presented to the Measurement and Control Section of the Institution of Electrical Engineers in London on 4th November

IN 1952, when only point-contact transistors were available in this country, the Electronics Division at the Atomic Energy Research Establishment began to study the use of these devices. One outcome of this early work was a bi-stable circuit, using only one transistor, which had obvious applications in digital instruments and computers. Assembly of the laboratory model of a small digital computer was started in 1954, with the object of producing a useful computer and at the same time gaining experience in the use of transistors on what was then a fairly large scale. This latter objective resulted in the available effort being concentrated on the transistor circuits, with minimum expenditure of effort on the store and input/output equipment, and in the decision to encounter a wide range of transistor circuit problems by using transistors throughout the computer.

The computer was operating on test programmes by mid-1955 and has been in regular use since August, 1956. It is seldom switched off and operates almost continuously, day and night, on productive computing or repetitions of previous computations. This record of continuous computing service with an all-transistor computer is rare, if not unique, and was described in a paper presented to the Measurement and Control Section of the Institution of Electrical Engineers in London on 4th November.

The computer, now named *Cadet,* is mounted on a laboratory bench. The side shown in Fig. 1 has the magnetic drum store, about a quarter of the transistor circuits mounted on sloping wooden boards, the power supplies, controls, and punched card machines for input and output. The remainder of the circuits are on similar boards on the other side of the bench. There are 400 transistors, of which 324 are point-contact type, and over 3,000 point-contact germanium diodes. The magnetic drum provides a working store with 410 locations and a backing store with very slow access to 16,384 positions.

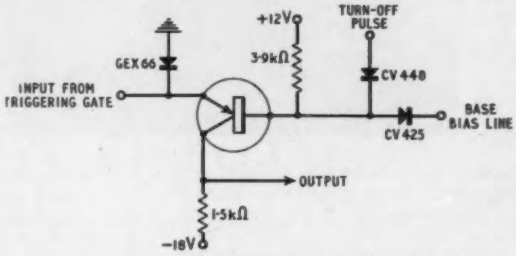


Fig. 2.—Bi-stable circuit with one point-contact transistor

Addition of two numbers, each equivalent to nine decimal digits, takes 15 millisec. This time includes reading the instruction and the two operands from the store and returning the result to the store. Multiplication takes 52·5 millisec. Most storage locations are only accessible for reading or writing once in each drum revolution, i.e. 16 times per second, so that the overall computing speed depends to a large extent on the skill

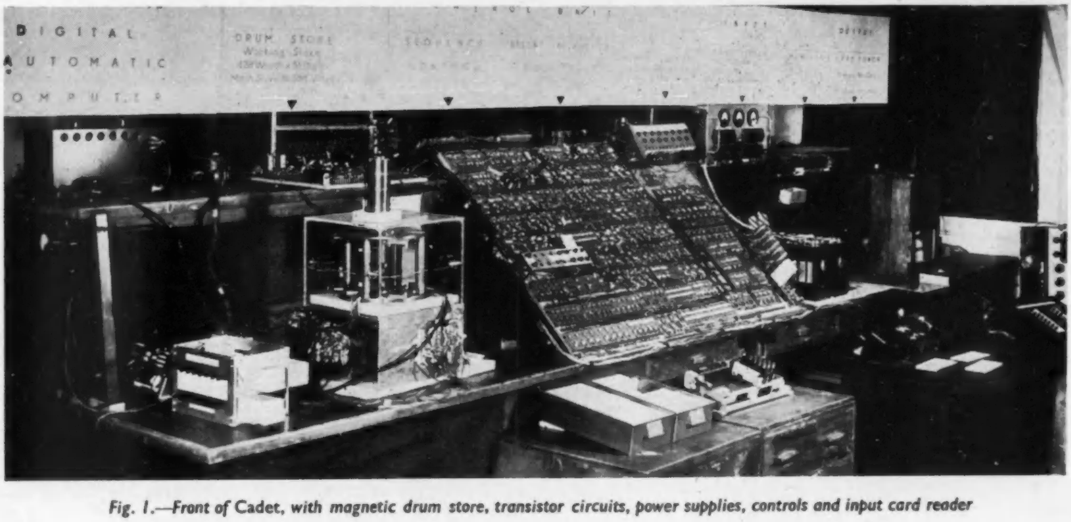


Fig. 1.—Front of Cadet, with magnetic drum store, transistor circuits, power supplies, controls and input card reader

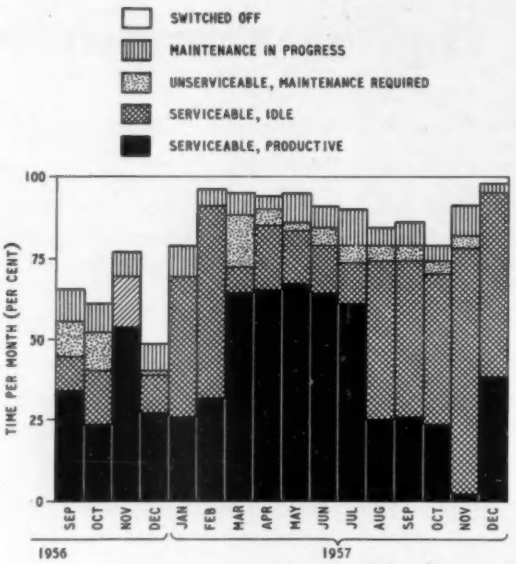


Fig. 3.—Record of serviceability for a period of 16 months

of the programmer in placing numbers and instructions in locations on the drum when they are available with minimum delay. In a typical programme the computer performs about 27 arithmetic operations per second.

The basic transistor circuit of the computer, shown in Fig. 2, has two stable states. In the " off " state the base of the transistor is biased at +1·5 V with respect to the emitter, and less than 2 mA leakage current flows from base to collector. The circuit is switched to the " on " state by rapidly discharging the condenser of a triggering gate into the emitter circuit. The point-contact transistor has a current gain greater than unity, and the resistor in the base circuit provides positive feedback so that the circuit is stable in the conducting state. The collector current is 10 mA without external load and about 25 mA with typical gating loads. The circuit can be switched back to the " off " state by applying a powerful positive pulse to the base. The majority of the point-contact transistors in the computer are in bi-stable circuits of this type or in similar mono-stable circuits which generate the turn-off pulses.

The operating log is summarised in Fig. 3. After an initial settling down period, *Cadet* has been switched on for about 90 per cent of each month and has been available for use for about 80 per cent of each month. The transistor failure rate was at first as high as 37 transistors in eight months, but has since fallen to only six transistors in the subsequent 11 months. The total power dissipation in the computer circuits is 70 W at 39 V, contributing to ideal operating conditions for the circuit components and a negligible failure rate. The reliability of the computer is limited mainly by the magnetic drum store, which was designed for less stringent conditions than those under which it now operates. A daily maintenance test has successfully detected most transistor and store failures before they produced errors in service. This test requires no attention and consists of running a series of test programmes for about 30 min while the transistor circuits are operating under adverse conditions. Most of the productive computing has been on one programme concerned with the analysis of crystal structures.

Experience with *Cadet* suggests that a very high order of reliability may be expected from computers and other equipment using modern junction transistors, which are known to be much more stable and robust than the point-contact transistors used in *Cadet*.

High-Speed Computer

IT has long been realised that the design, construction and maintenance of digital computers can be greatly simplified by restricting the number of different logical elements, or " building bricks," that are used. An additional advantage is obtained if the use of such units can be specified by simple mathematical laws without reference to the detailed circuits involved. In this way, the tasks of the logical designer and the circuit designer can be separated.

In a paper prepared by Mr. D. Eldridge (I.B.M. British Laboratories and formerly of Ferranti, Ltd.), which was read at a meeting of the Measurement and Control Section of the Institution of Electrical Engineers in London on 4th November, a new method is described for realising logical functions using square-loop ferrite cores and transistors. Complex circuits can be built up from identical elements, each consisting of one core, one transistor, three diodes and one resistor. The technique differs from earlier methods in that the current required to set the core to the " 1 " state is derived from a common supply and not from a previous stage.

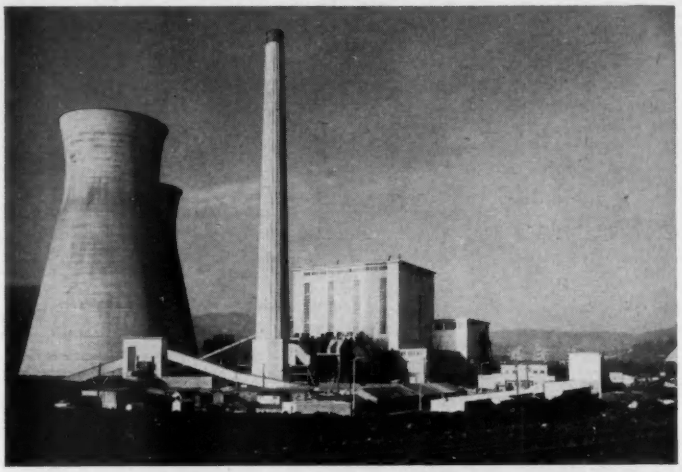
The control of digit transference between stages is effected by the transistor whose collector and emitter are connected across one winding of the core. When a " 1 " is to be set in the core, the transistor is arranged to appear as an open circuit, in which condition flux reversal is possible; when an " 0 " is to be set, the transistor appears as a short circuit preventing reversal of flux.

The core is reset to " 0 " at a controlled rate, producing a standardised voltage across the output windings. The logical operations are carried out by the analogue addition to these voltages. The system requires only two low-voltage d.c. supplies and is tolerant of voltage and component variations. It operates reliably at digit rates of 500 kc/s. Mr. Eldridge also includes in his paper a description of an experimental application of the method designed to test its performance.

Faraday Lecture

THIS year's Faraday Lecture of the Institution of Electrical Engineers will be delivered by Dr. H. A. Thomas, whose subject will be " Automation." The Lecture is to be presented in London at the Royal Festival Hall on Monday, 26th January, at 6 p.m. Admission will be free by ticket available from the Secretary, Institution of Electrical Engineers, Savoy Place, London, W.C.2, during December; applicants are requested to enclose a stamped addressed envelope.

Dr. Thomas, who is manager of the Instrumentation and Control Section of the Engineering Department of Unilever, Ltd., will illustrate his lecture by films and working models. The theme of the lecture is that man's controlling influence on machinery is beginning to be replaced by electronics and computers in the second industrial revolution.



ROGERSTONE POWER STATION

Official Opening by

Sir Christopher Hinton

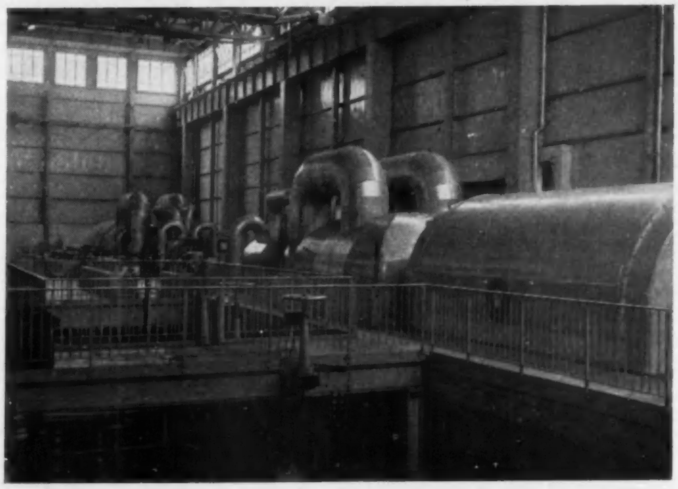
THE latest South Wales power station, at Rogerstone, near Newport, Monmouthshire, was officially opened on 30th October by Sir Christopher Hinton, K.B.E., F.R.S., chairman of the Central Electricity Generating Board. In his speech Sir Christopher referred to the growth in demand in the area caused by large-scale industrial development and the power station programme undertaken to meet this demand. Uskmouth "A" and Rogerstone had been commissioned and when Uskmouth "B" and Aberthaw were also completed the generating capacity available would be adequate to meet present needs. It was expected, however, that by the 1970's more power would be required locally than could be obtained from Welsh coal available for power stations and that one or possibly two nuclear stations would be situated in the South Wales area. Sir Christopher stressed the importance of a high load factor, and expressed the hope that the figure of approximately 60 per cent achieved in South Wales, which was the highest in the country—comparing with the overall figure of 48 per cent—would be attained elsewhere.

He commented on the fact that the station had been built in a shorter time than any other constructed since the war, only three years elapsing between cutting the approach road in September, 1954, and commissioning the first set on 17th September, 1957. He said that the economic operation achieved was made possible by good design and construction coupled with a situation near the coal pits and the load centre. Sir Christopher then unveiled a commemorative plaque which was subsequently mounted in the turbine hall.

Constructed at a cost of approximately £7 million, the station feeds the eastern end of the 6·6 kV network. Two 60 MW hydrogen-cooled turbo-alternators manufactured by C. A. Parsons & Co., Ltd., are arranged for unit operation with two radiant type Babcock & Wilcox 550,000 lb/hr pulverised fuel fired boilers, with steam conditions of 950 p.s.i. and 925 deg F at the superheater outlet. A full description of the station appeared in the *Electrical Review* of 25th July last.

Although originally intended for two shifts only, Rogerstone has been operated as a three-shift base-load station, and an overall thermal efficiency exceeding 30 per cent has been obtained.

The divisional controller, Mr. W. Wilde, presenting Sir Christopher Hinton with a table lighter and ash tray modelled on Rogerstone's two cooling towers



The two 60 MW Parsons turbo-alternators in the turbine hall

NEW BOOKS

Receiving Aerial Systems. By I. A. Davidson. Pp. 152; figs. 70. Heywood & Co., Ltd., Tower House, Southampton Street, London, W.C.2. Price 21s.

In this book the design of aerials for the reception of broadcasting and television is discussed, together with some practical aspects related to their construction and installation. The emphasis is on receiving aerials and the additional problems that are encountered when these are part of a domestic installation; the author, who is with Messrs. Belling & Lee, Ltd., is well placed to discourse on this aspect of the subject.

The treatment is likely to appeal mainly to radio amateurs and those concerned with service and installation, the style being, in many places, popular and conversational rather than rigorous and scientific. Nevertheless, in Chapter II a fair account of the fundamentals of wave propagation and aerials is given, together with the development of simple and essential formulæ for aerial gain and received power. Chapter III is concerned mainly with radio reception at the longer waves; this is not the main subject of the book and the treatment is a little sketchy. Further information on interference-reducing characteristics and on aerial and input-coil losses would have contributed to the value of this section. In Chapter IV we are introduced to the concept of directional characteristics, especially in relation to gain and the elimination of unwanted signals and interference. The next chapter deals with the simple half-wave dipole, together with some variants including the reflector, the director, and the folded dipole. A little more design data would not be amiss here, and there is inadequate treatment of the effect of wire diameter on aerial impedance: the reduction of the tuning length below a half-wavelength is ascribed entirely to the detuning effect of the central insulator, without reference to the shortening arising from the finite radius of the aerial conductors. Aerial resistances seem in many places to be taken as 75 ohms irrespective of circumstances, whilst bandwidth is usually given as "adequate for television" (presumably monochrome, British standard) with little numerical information.

Chapter VI deals with a number of popular aerials for single-channel reception, including the H, X and K types. Delta and quarter-wave matching techniques are briefly mentioned.

Combined aerials for two channels are treated in the next chapter and a considerable amount of useful information is given, especially in relation to Bands I and III television aerials, including dipoles and Yagi arrays. Chapter VIII contains a number of practical hints on choice of aerial, particularly in relation to field strength and the avoidance of television "ghosts."

The next chapter deals with radio-frequency cables and accessories, including simple circuit means for combining aerials and receivers. This is a valuable chapter, and it would have benefited from a little more detailed information, especially on suitable cable types and connections.

Chapters X and XI deal respectively with the mechanical design of the aerial and its installation. There is much here by way of practical hints, both in relation to outdoor and indoor types, and this section should be valuable to those seeking guidance on their own installations.

A brief chapter on the measurement of aerial characteristics is followed by three appendices dealing with decibels (including tables), polar diagram plotting paper, and attenuation of resistive networks for common aerial working.

The book contains some excellent photographs of aerial installations, and of the effect of signal level on the quality of a television picture. It should make useful reading to those who are seeking an introduction to this complex subject.—L.L.

Effect of Surface on the Behaviour of Metals. Published for the Institution of Metallurgists by Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1. Pp. 100; figs. Price 21s.

The Institution of Metallurgists holds an annual refresher course for its members, each year a particular theme being chosen, and during the course leading authorities read papers giving the latest information on various aspects of the subject under consideration. Those read during the 1957 course, dealing with the important part which surface plays in influencing the behaviour of metals, have just been published in full in book form.

The first paper, by Dr. G. L. J. Bailey, deals with the preparation of surfaces for examination, and discusses modern methods of examining the topography and structure of surfaces both on the microscopic and atomic scales. A paper by Dr. T. P. Hoar follows showing how the treatment that a surface has received has a bearing on its future chemical behaviour. Dr. F. T. Barwell then summarises the present state of knowledge on the relationship between surface condition, frictional resistance and wear and, finally, Dr. R. W. B. Stephens deals comprehensively with the influence of the surface on the physical properties of a metal. After explaining why the surface of a metal should exhibit a different effect from the interior, he considers optical properties; skin effect; moiré fringe patterns in electron micrographs; electrical resistance; thermal properties; catalysts; magnetic properties; the domain theory; thermomagnetic and galvanometric effects; and diffusion.

The present series of papers gives in concise form a great deal of information collected from widely scattered sources about a subject which, although not completely understood, is becoming increasingly important to physicists, chemists and engineers as well as to metallurgists.

BOOKS RECEIVED

The Structure of British Industry. Edited by Duncan Burn. Pp. 499; figs. Cambridge University Press, Bentley House, 200, Euston Road, London, N.W.1. Price 50s.

Electricity in Aircraft. By F. G. Spreadbury. Pp. 342; figs. Constable & Co., Ltd., 10, Orange Street, London, W.C.2. Price 40s.

Nuclear Reactors for Power Generation. Edited by E. Openshaw Taylor. Pp. 144; figs. George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. Price 21s.

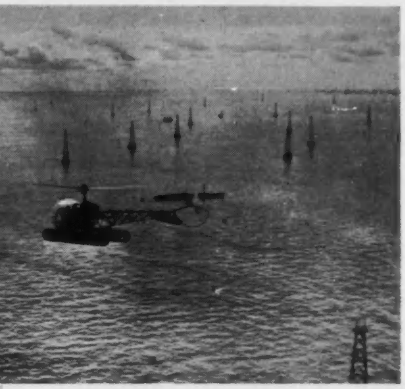
Principles of Noise. By J. J. Freeman. Pp. 299; figs. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 74s.

An Electronic Organ for the Home Constructor. By Alan Douglas. Pp. 100; figs. Sir Isaac Pitman & Sons, Ltd., Pitman House, Parker Street, Kingsway, London, W.C.2. Price 15s.

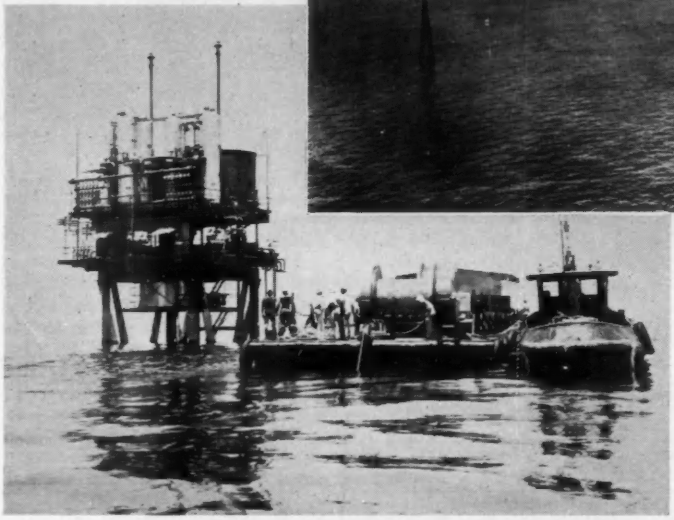
Calcul des Electro-Aimants Industriels. By A. Jung. Pp. 99; figs. Dunod Editeur, 92, rue Bonaparte, Paris, 6e. Price 900 fr.

Physics and Mathematics in Electrical Communications. By James Owen Perrine. Pp. 261; figs. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 50s.

Right: Drilling rigs over Lake Maracaibo. Helicopters are much used for transporting men and materials



Below: Cable-laying barge approaching a block station



SUBMARINE POWER CABLES

PLASTIC INSULATION USED IN VENEZUELAN LAKE

NEARLY 200 miles of 11·5 kV plastic-insulated submarine cable has been supplied by the Telegraph Construction & Maintenance Co., Ltd., and laid in Lake Maracaibo, Venezuela, since 1955. This lake is about 90 miles long by 80 miles wide and opens through a narrow channel to the Caribbean Sea. The lake area is rich in oil which has been developed by several companies, the largest of which are Creole Petroleum Corporation and Compania Shell de Venezuela (C.S.V.).

In 1945 the Venezuelan Government opened up the lake for further development and large concession areas were obtained by C.S.V. Up to this time Shell had confined its drilling to land locations while drilling in the lake was carried out by Creole & Mene Grande Oil Co. The depth of water generally in the Shell area is about 90ft and the oil wells flow freely under natural pressure via a network of submarine pipes, to gathering stations erected in the centre of blocks of oil wells. From these points it is necessary to pump the oil along trunk pipelines, either to a refinery or to shore stations for further bulk storage prior to shipment.

Power for pumping can be supplied by local diesel generators, or preferably by the more economical method of laying submarine cables direct to the gathering stations. In the present instance, energy is taken from a 33/11·5 kV substation erected 18 miles offshore and distributed at 11·5 kV to the gathering stations where 11·5 kV/440 V transformers are mounted together with the associated switchgear.

As may well be imagined, there is a vast network of pipes interlinking the various oil wells and installations, both on shore and in the lake in this oilfield area and a route was chosen for the 11·5 kV transmission cable which would, as far as possible, avoid existing pipelines. All pipes are protected from corrosion by the application of coatings and cathodic protection.

Teredo and corrosion hazards threaten the cables no less than the oil pipelines. A tinned copper tape screen over the insulated conductor serves as a barrier against the teredo. In contrast to conventional paper-insulated cables the dielectric in this cable is unaffected by water and is non-hygroscopic. To avoid underwater joints long lengths of cable were required, and it was preferred that cables should be supplied on drums. Telcon's answer to these problems was to design a polythene-insulated cable with screened cores, p.v.c. sheathed, armoured with galvanised steel wires, each wire being separately covered with p.v.c. Jute serving was applied overall.

Having no lead sheath, the cable is extremely light compared with its lead-sheathed counterpart, and it was possible to supply and ship to Venezuela drums containing between 2,400 and 3,400 metres of cable, each weighing up to 20 tons. Details of cable construction are:—A stranded copper conductor 19/·072in covered with two layers of semi-conducting papers and insulated with "Telcothene" (radial thickness of 0·110in); this is, in turn, covered with colloidal graphite, semi-conducting paper and tinned copper tape. Three cores were laid up with tinned copper 7/·064in interstitial strands. Identification of cores was provided by coloured paper tapes below the tinned copper screen. The laid-up cable was p.v.c. sheathed and wire armoured, and the whole was then compounded jute served and whitewashed.

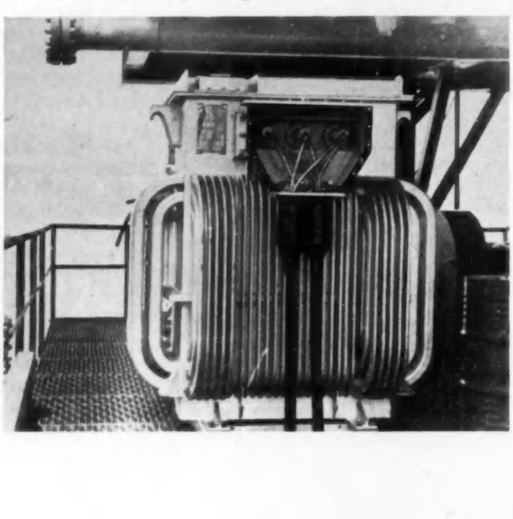
Unlike paper power cables the polythene-insulated cable permits of tests being made on the insulated core at intermediate stages of manufacture, and tests were carried out on the insulated core of the present cable to ensure that the whole of the insulation was free from ionisation at voltages in excess of service conditions. The continuous type of test applied by Telcon is extremely sensitive and ensures that at no point does any discharge occur under the specified conditions.

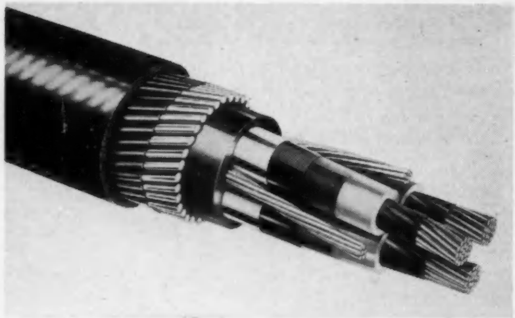
Joints between two half-lengths of cable in the p.v.c.-sheathed stage were carried out by an injection moulding process based upon Telcon's considerable experience in jointing submarine communication cables. The conductors were jointed by silver soldering individual wires of the strand, this being followed by the repair of the semi-conducting paper. The core was then inserted in a mould of special design and molten polythene injected. After cooling, the screening layers were restored and the interstitial conductors jointed. Following this, p.v.c. filling was applied, a p.v.c. tube replaced the sheath which had been cut away for jointing purposes, and further moulding completed the seal between the tube and the p.v.c. sheaths.

A high-voltage d.c. test was applied to ensure that both the polythene insulation and p.v.c. sheath had been restored to perfect condition and the double length of cable was then armoured with individually p.v.c.-covered armour wires and served in one length. Routine acceptance tests and a d.c. high-voltage test were carried out before dispatch to Venezuela.

Intermediate on-site joints were made above water on platforms of oil wells or block stations on the cable route. Following a telescoped conductor joint the insulation was restored by means of a "Telcohesive" tape. This is a plastic self-adhesive tape developed by Telcon specially for jointing and terminating polythene cables. Having been applied it forms itself into a homogeneous whole with electrical qualities approximating very closely to the insulation of the cable itself. Although special care is required in its application, it is in some ways simpler to apply than paper. In fact, the whole of the 11·5 kV jointing and terminating was carried out successfully by men who had no previous experience as jointers. Joints were protected by standard cast iron joint boxes which were left unfilled. Initially, termination boxes were filled with bitumen. The boxes and armouring wires were lightly insulated to provide facilities for cathodic protection of the armour. This was not immediately applied and will be necessary only if the p.v.c. cover to the armouring wires is damaged by marine borers, or in the event of mechanical damage laying bare the steel wires.

Cable termination in trifurcating box of 11·5 kV/440 V transformer





Telcon 11·5 kV polythene-insulated power cable for submarine installation in the saline and oily waters of Lake Maracaibo, Venezuela, for transmission in the lake oilfields

An advantage of plastic-insulated cable is the absence of the problems which would have been associated with compound migration had impregnated paper cables been used. In the present instance the cable has a vertical rise of 100ft or more at intermediate wells or block stations. The installation was carried out by C.S.V. from one of their 250 ton pipe barges suitably modified and the site jointing was undertaken by their local electricians, under the supervision of a Telcon engineer.

Nuclear Power for Ship Propulsion

IN his presidential address to the North-East Coast Institution of Engineers and Shipbuilders on 20th October, Mr. E. J. Hunter (Swan Hunter Group) expressed the view that the application of nuclear power to the propulsion of ships presented an unsurpassed technical problem at the present time.

In the light of available knowledge it appeared that nuclear fission or fusion could be only complementary to the use of coal or oil for many years. No atomic ship in use or under construction was economic in the ordinary sense, but the recent crossing of the North Pole under ice by two U.S. submarines, in greatly shortening the route for freight from the Atlantic to the Pacific, might well equal in significance the opening of the Suez and Panama Canals. The greatest of numerous technical problems arose, perhaps, from danger of radiation due to marine hazard and damage in port.

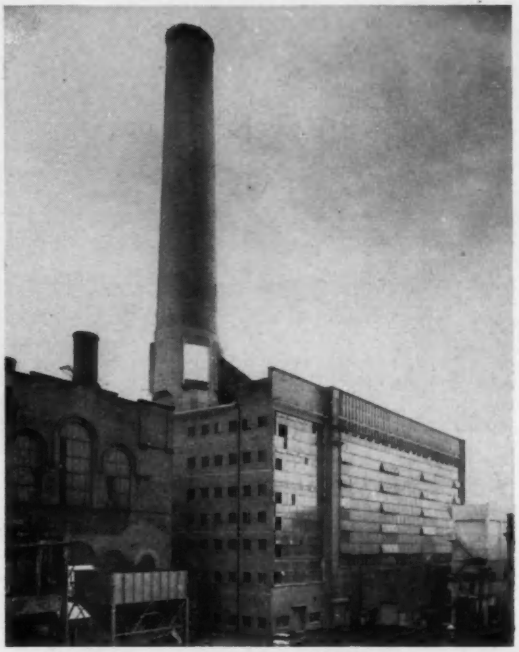
When Sir John Cockcroft delivered the 27th Andrew Laing Lecture to the same Institution on 31st October he reviewed the present state of development of nuclear propulsion for shipping in the light of the technical performance of the U.S. nuclear submarines and the information disclosed at the Geneva Conference on the development of commercial nuclear propulsion.

Sir John explained that five types of nuclear reactor for propulsion purposes had so far been considered: the pressurised-water reactor, the boiling-water reactor, the sodium-cooled reactor, the gas-cooled graphite-moderated reactor and the organic-liquid-moderated reactor. The pressurised-water reactor had been adopted for nearly all U.S. naval units and by the U.S.S.R. for their ice breaker, but the capital costs were high. On present information the boiling-water reactor seemed likely to have appreciably lower capital costs than the pressurised-water reactor, and with this substantial development it appeared possible that capital costs of this system might approach those of conventional propulsion systems.

Dalmarnock Extensions

EXTENSIONS to Dalmarnock power station of the South of Scotland Electricity Board were inaugurated last Friday by the Lord Provost of Glasgow. Sir John Pickles, chairman of the Board, who presided, paid a tribute to the foresight of Glasgow Corporation in planning for an ultimate capacity of 200 MW when they first located the station in 1910. The generating capacity of the original station, the first part of which was commissioned in 1920 and the second part in 1926, was 137·5 MW. Two 50 MW turbo-alternators and associated boilers were added in 1938. The present extension comprises two 60 MW Parsons turbo-alternators with steam supplied at 900 p.s.i. and 900 deg F from six 200 klb/hr Yarrow boilers. The extension necessitated the demolition of the first five turbo-alternators and the first 16 boilers.

The boilers are of the single-flow water-tube type with primary and secondary superheaters and travelling twin chain grate stokers. The steam temperature is controlled by a desuperheater installed between the primary and secondary superheaters. Coal is fed from the overhead bunkers to the twin grate stokers via travelling chutes. The boilers are each equipped with "Electroflo" automatic control.

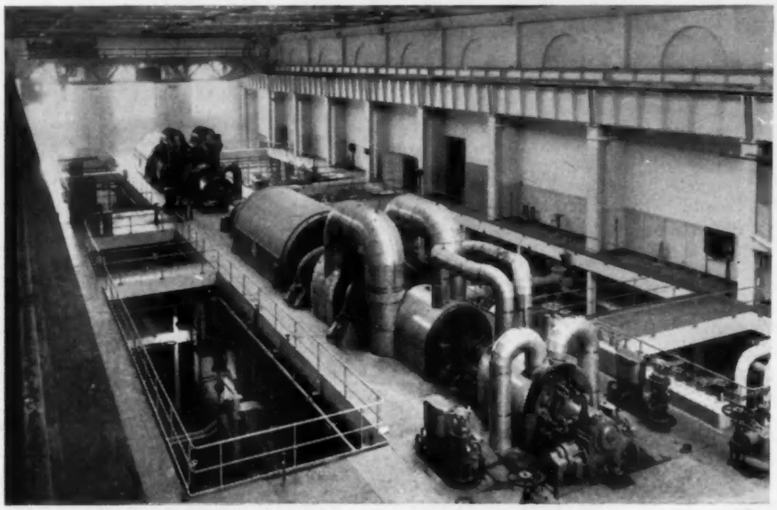


Exterior view showing the new boiler house

Each 60 MW turbo-alternator consists of a three-cylinder turbine driving an 11·8 kV hydrogen-cooled generator. The h.p. and i.p. sections of the turbine each consist of nineteen reaction stages, whilst there are six reaction stages in each branch of the double flow l.p. cylinder. At five points on the turbine, steam is extracted for the feed heating system consisting of two l.p. heaters, a high-level de-aeration plant and two h.p. heaters. The condensate leaves the final stage at a temperature of 385 deg F. Steam from the l.p. cylinder passes to the single-shell, three-pass, surface type Parsons condenser, having a total cooling surface of 57,000 sq ft. At full load conditions with a cooling water flow of 42,500 gal/min at a temperature of 60 deg F, the design vacuum is 28·9in Hg. There are three electrically-driven feed pumps and two steam turbine-driven feed pumps, one motor-driven feed pump being required for each turbo-alternator, with the third pump as standby. The steam turbine-driven feed pumps are emergency pumps and cut-in gear automatically brings them into operation in the event of an electric feed pump failure. Each of the five pumps has a capacity of 600,000 lb/hr with a delivery pressure of 1,250 p.s.i. Circulating water is taken from the River Clyde by four 285 h.p. c.w. pumps.

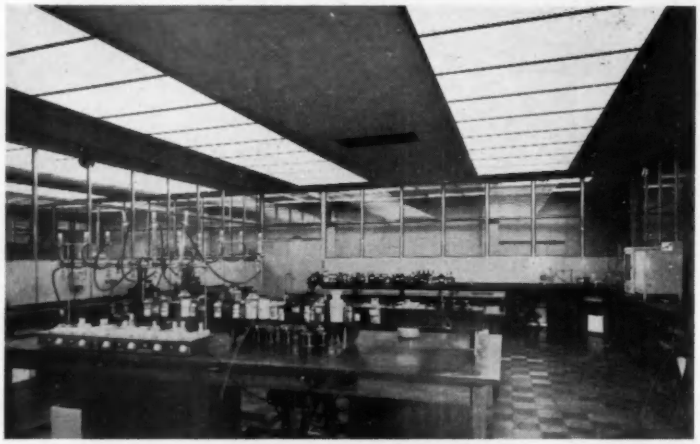
Each alternator is connected to 132 kV switchgear through a 72 MVA, 11·8/132 kVA generator transformer. A 5 MVA, 11·8/3·3 kV unit transformer connected to the generator terminals, supplies the machine auxiliaries.

Turbine hall showing the two 60 MW Parsons turbo-alternators



To ensure complete integration of the old and new plant from a generation viewpoint, a new control room has been constructed to provide a centralised control. The large, glass, soundproof frontage of the control room gives the engineer in charge an uninterrupted view of the plant in the turbine house.

The consulting engineers are Messrs. Strain & Robertson in association with Messrs. Ronald Walker & Co. The main contractors are:—Boilers, Yarrow & Co., Ltd.; turbo-alternators, C. A. Parsons & Co., Ltd.; main switchgear, A. Reyrolle & Co., Ltd.; generator transformers, Bruce Peebles & Co., Ltd.; auxiliary switchgear, English Electric Co.; control panels and desks, Metropolitan-Vickers.



Laboratory Lighting

In the new laboratory for testing all types of winding wire coverings opened by British Insulated Callender's Cables, Ltd., at the company's Huyton Quarry (Lancs.) works, an illuminated ceiling lighting system has been installed by Lumenated Ceilings, Ltd. Four large panels having a total area of over 800 sq ft have been fitted flush with the false ceiling surround of off-white acoustic tiles, and above each panel in the space under the pitched roof are eighteen 5ft 80 W warm white fluorescent tubes with reflectors. The light is evenly diffused through the sheets of corrugated plastic to give shadow-free lighting throughout the laboratory.

Above: Lumenated ceiling lighting system installed in the new laboratory of British Insulated Callender's Cables

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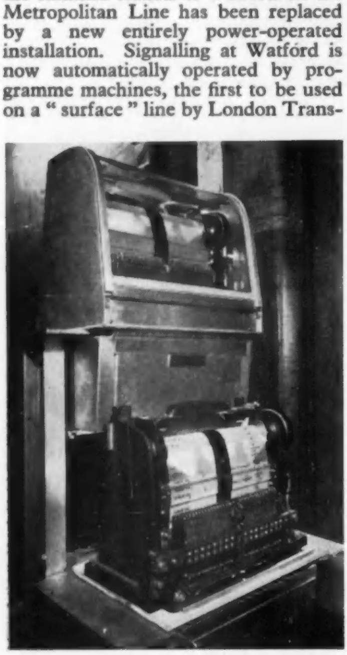
Programme Machines for Automatic Signalling

The mechanical signalling system at the terminal station at Watford on the Metropolitan Line has been replaced by a new entirely power-operated installation. Signalling at Watford is now automatically operated by programme machines, the first to be used on a "surface" line by London Transport. One sequence machine and one time machine are employed. Together they can carry out various programmes including the reversal of trains of multiple-unit stock in either platform and their dispatch at the correct departure times; the automatic setting of routes to run the locomotive to the other end of a train before dispatching it at the correct time; shunting preparations for the morning service; and the routing of trains at night and in off-peak periods to the appropriate sidings.

The programme machines carry a plastic roll on which is typed the details of each train passing over the section of line in sequence. These details include the destination of the train, the train number and its time. Between the rows of typing, holes are punched in the plastic roll which interpret the information contained in typescript. Electrical contacts are actuated through these holes to control the signalling equipment. Each train that passes causes the roll to step forward so that the electrical contacts read the next required train operation.



Left: The programme machine installation at Watford showing the sequence machine mounted above the time machine, on which one of the plastic rolls can be seen as well as the row of electrical contacts

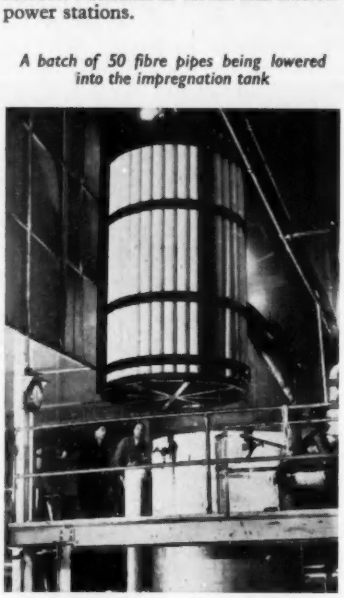
Pitch Fibre Pipe

Pitch fibre pipe was first used in 1856 for gas supply in Germany. At the turn of the century its use rapidly spread and many thousands of miles have been installed in major electrical undertakings throughout the world in the form of conduit. In 1954 the first British-made fibre pipe was introduced by the Key Engineering Co., Ltd., and extensions to their factory at Larkfield, Kent, were recently completed. Wherever possible automatic processes have been installed to ensure the economic production of fibre pipe to consistently fine limits.

There are three main processes in the manufacture of the finished article: the production of the white fibre pipe; its impregnation with pitch under vacuum; and subsidiary machining of the finished article to ensure a leak-proof joint between pipes when installed. The pulp is fed from the preparation plant on to a moving sheet of fine felt and goes on to a revolving mandrel which gathers the mixture from the felt and builds up the wall thickness of the pipe to the required degree. The wet pipes are then conveyed automatically to drying ovens and at the end of this process the mandrel is automatically ejected. The batches of pipes are then conveyed to the impregnation section where they are subjected to alternate vacuum and pressure impregnation cycles.

The pipe is very light and loss by breakage is stated to be virtually eliminated in normal handling and storage. Fibre pipes are suitable for underground wiring ducts which can be tapped at any point along their length, facilitating re-arrangement of equipment. Fibre pipes are also used extensively as leak-proof, smooth, non-corrosive conduit in steam and nuclear power stations.

A batch of 50 fibre pipes being lowered into the impregnation tank



GENERATION AND DEVELOPMENT

New Hire-Purchase Arrangements

Following the removal of hire-purchase restrictions, the **North Western Electricity Board** has announced new hire-purchase conditions affecting several types of electrical appliances which have hitherto been subject to an initial deposit of 33⅓ per cent and a maximum payment period of two years. In all cases the initial payment required by the Board will be equivalent to one quarterly payment. The maximum period of agreements for the various appliances concerned will be as follows:—

Five years: Refrigerators.

Three years: Washing machines, spin dryers, tumbler dryers, flat plate and rotary ironers, vacuum cleaners and floor polishers.

Two years: Fires and space heaters, blankets and pads, mixing machines, shavers and power tools.

Kettles, pans and pressure cookers, though normally subject to a two-year maximum period, can be included in the same agreement as a cooker taken on hire-purchase and the repayment may then be spread over the same period as the cooker.

These new terms do not affect those appliances which were freed from restriction in September: cookers, storage water heaters, immersion heaters and wash boilers. Hire-purchase on these items already allows for an initial payment equivalent to a quarterly payment and a maximum payment period of five years.

The **South Western Electricity Board** has also introduced new hire-purchase terms. Electric refrigerators and washing machines can now be obtained for 10 per cent down with instalments spread over five years. The maximum period of repayment for electric cookers and water heaters is extended to seven years. A family-sized cooker costing £32 5s can now be installed for the first of 28 quarterly payments of 29s 11d. New terms are also available for other electrical appliances.

The **Eastern Electricity Board** announces that it will sell any domestic electrical appliance for an initial deposit of 1s in the £, a facility which has so far applied only to cookers and water heaters. Consumers will now be able to buy immersion heaters, wash boilers, washing machines and most other domestic appliances for 1s in the £ down with repayments spread over four years. Cooker and water heater repayments may be spread over seven years. Commercial installations and agricultural equipment can be paid for by a deposit of 2s in the £ and repayments over two years. These facilities will apply for installations of block type thermal storage heaters, including the wiring of the premises and for the installation of commercial refrigeration and catering equipment.

Price Reduction in North West

The North Western Electricity Board has decided to pass on the benefit of the 0·01d/kWh reduction in the bulk supply tariff for the six months ended 31st March next. Consumers will pay a similar amount less on their bills for the two quarters next following the first normal meter reading after 30th September. The total amount of the concession is about £200,000.

Transfer of Pinkston Station

In accordance with an agreement reached some months ago, Pinkston generating station was formally handed over to the South of Scotland Electricity Board by Glasgow Corporation at a luncheon given by the Lord Provost last Friday. The transfer was symbolised by the convener of the Corporation's Municipal Transport Committee (Councillor J. Bennett) presenting to the chairman of the Board (Sir John Pickles) an oil painting of the station by Norman Wilkinson, C.B.E., P.R.I., specially commissioned by the Corporation for the ceremony. Mr. A. Kelso, the Board's Glasgow Area manager, presented to the Lord Provost a coloured enamel coat-of-arms of Glasgow which became "vested" in the Board's predecessors, the South West Scotland Electricity Board, when the electricity supply industry was nationalised. The present occasion was considered to be a most appropriate one to return the coat-of-arms to the Corporation.

Pinkston has been supplying Glasgow's transport system since 1901. The original plant had an installed capacity of 11,500 kW and by 1954, when a major extension was completed, the capacity had reached 87,500 kW. Because of the decision to abandon tramcars the Corporation asked the Board to take over the station. This is being done on the basis of the Board's being responsible for the outstanding loan debt at the date of transfer. Certain of the older plant is obsolete and the effective plant capacity taken over is 65,000 kW. The station is already connected to the Board's system at Port Dundas substation and reciprocal arrangements have been in operation for some time.

Load Loss Through Tramway Abandonment

Following Glasgow Corporation's decision to abolish tramcars by 1963, the South of Scotland Electricity Board has submitted a claim for compensation for the loss that will accrue to Pinkston power station. The station supplies the power for the municipal tramway, trolley-bus, and underground services. At the time when it was agreed that the station should be transferred it had been assumed that trams would be operating for another 10 to 15 years.

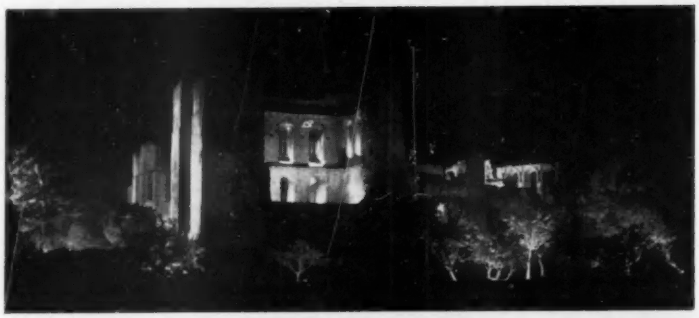
When the trams are abolished by 1963, the use of the power from Pinkston will be restricted to the municipal underground trains and to about 200 trolley-buses. The Transport Committee of the Corporation has agreed to negotiate on the Board's claim.

New Scottish Hydro-Electric Stations

The North of Scotland Hydro-Electric Board has brought into operation another two water power stations —Lubreoch in Glen Lyon and Lochay in Glen Lochay near Killin, in Perthshire. These two stations, which are part of the Killin section of the Breadalbane hydro-electric scheme, will have an estimated average annual output of 173 million kWh. They both use water regulated by the large

EASIER HIRE PURCHASE FOR ELECTRIC COOKERS

Mr. H. D. B. Wood (deputy chairman, Eastern Electricity Board), Mr. G. P. Dixon (Colchester district manager), the Mayor of Colchester (Councillor Mrs. May Cook) and Mr. C. Clarke (district commercial engineer) at the recent opening of the Board's new Colchester service centre



Atlas trial floodlighting at Kenilworth Castle

dam at Lubreoch. This dam, 130ft high and 1,740ft in length, has raised the water level of Loch Lyon into which additional water is brought by aqueduct from hill streams in Glen Dochart and Glen Lochay.

The first stage is the Lubreoch power station (4,000 kW). At Stronuich, three miles downstream, there is another dam which has formed a small new loch. From there water is led through a $4\frac{1}{2}$ mile long tunnel and a pipeline to the Lochay power station. This power station (total capacity 47,000 kW) will have two main 22,500 kW turbo-alternators and a 2,000 kW machine. The first of the main sets is now working and the other is nearing completion. The output of the new stations is fed into the Highland grid at Killin.

The civil engineering consultants are Messrs. James Williamson & Partners, the electrical and mechanical consultants Messrs. Merz & McLellan, and the architect Professor R. H. Matthew, C.B.E., M.A., F.R.I.B.A. The contractors for the Lubreoch plant are Bruce Peebles & Co. (turbine supplied by Boving & Co.) and for the Lochay plant the English Electric Co. (main sets) and Boving & Co. (2,000 kW set).

Power Station Working Conditions

In the Isle of Man Tynwald recently Mr. E. Callister tabled a question regarding working conditions at the Electricity Board's generating station at Peel. Replying on behalf of Sir Joseph Qualtrough, the Board's chairman, who was ill, Mr. G. H. Moore said that the Board visited the power station on 7th October and although they did not accept some of the statements in the report of Mr. C. P. Gourley (formerly H.M. Inspector of Factories for North-West England) they decided to comply with his recommendations and had ordered the necessary equipment. There had been no delay.

Kenilworth Castle Floodlighting

Last week at Kenilworth Castle, Warwickshire, visitors were shown new floodlighting techniques, using Atlas lighting equipment. This experimental installation, carried out for the Ministry of Works, is static but uses many of the new techniques and equipment employed in the *Son et Lumière* spectacles at Woburn, Greenwich and Cardiff. The installation was switched on by Mr. Harmar Nicholls, M.P., Parliamentary Secretary to the Ministry of Supply.

The lighting is designed not only to present an impressive visual spectacle, but to recreate the history of the building. Directional lighting from low in the east emphasises the massive strength and height of the east walls. To suggest the pageantry of the past, shafts of gold light penetrate the upper windows, while pools of cold blue light convey the grim purpose of the keep. Minimum frontal lighting emphasises the third dimension so that the eye is conscious of a series of receding vertical planes culminating in the distant brightness of John of Gaunt's Hall.

A variety of Atlas incandescent lamps and fluorescent tubes are used. The strong directional lighting is from incandescent sources, varying from 2,000 W lamps lighting the east walls to the new 150 W low-voltage fittings and lamps which provide narrow shafts of light through the keep windows. Secondary lighting and colour effects are from reflector type fluorescent tubes. Because of the extensive use of fluorescent lighting the total load is only 31 kW.

Glasgow Electro-Heat Exhibition

A series of demonstrations of the use of electricity for industrial heating processes will be the main feature on the stand of the Electrical Development Association at the Electro-Heat and Productivity Exhibition at Kelvin Hall, Glasgow, 10th to 14th November.

One of the exhibits will be a vibrating screen for sifting wet sand, clay, gravel, slag and similar material. Apart from the screen being caused to vibrate by an electric motor, it is electrically heated to speed up the output. A display of resistance soldering will show how electric resistance heating provides industry with a simple and reliable tool to give rapid localised heating. A range of electric immersion heaters specially designed for use in corrosive liquids will show how these can be employed where heated electroplating, pickling and other acidic solutions are required.

Another specialised application of electricity, the ultrasonic flaw detector, enables machined parts, forgings, welded joints and raw material to be examined for the presence of cracks, slag inclusions and other defects. The particular advantage of the method is that the results of the test are immediately available, and no special skill is required to operate the instrument.

A section of the stand will be devoted to a display of the books in the E.D.A. "Electricity and Productivity" series and attention will also be drawn to the series of E.D.A. films on industrial electrification, in particular the latest film, "Electro-Heat in Industry."

Supply Restored for TV Programme

After receiving a complaint from a television viewer who wished to see the State opening of Parliament on 28th October, the Southern Electricity Board restored the electricity supply to an area on the outskirts of Wootton Bassett where maintenance work was to be carried out. The supply was cut again after the programme had ended.

OVERSEAS

Electricity Expansion in Malta

Malta's electricity generating station, which commenced operating in 1954, is now working at full capacity and two 5,000 kW turbo-alternators are to be installed to meet the growing demand, states a Barclays Bank D.C.O. report.

Russian Credit for Aswan Project

The Soviet Prime Minister, Mr. Khruschev, recently announced that it had been decided to grant the United Arab Republic a credit of up to 400 million roubles (about £33 million) for the first stage of the Aswan Dam project. He said that this would be for expenses connected with the delivery from the Soviet Union of machines, equipment and other materials which were lacking in the United Arab Republic. Technicians and experts would also be provided. Repayment of the credit would begin when the first stage of the scheme had been completed.

The cost of the complete scheme is estimated at £400-£500 million.

New Uganda Tariffs

The Uganda Electricity Board has introduced new tariffs in the Mbarara/Kikagati district, reducing the number of different tariffs to four: a domestic three-step block tariff; a general block tariff; a floor area block tariff intended for hotels, residential clubs, hospitals, boarding schools, etc.; and a maximum demand tariff. The Board is considering the use of similar block tariffs throughout its area.

Electrostatic Precipitators

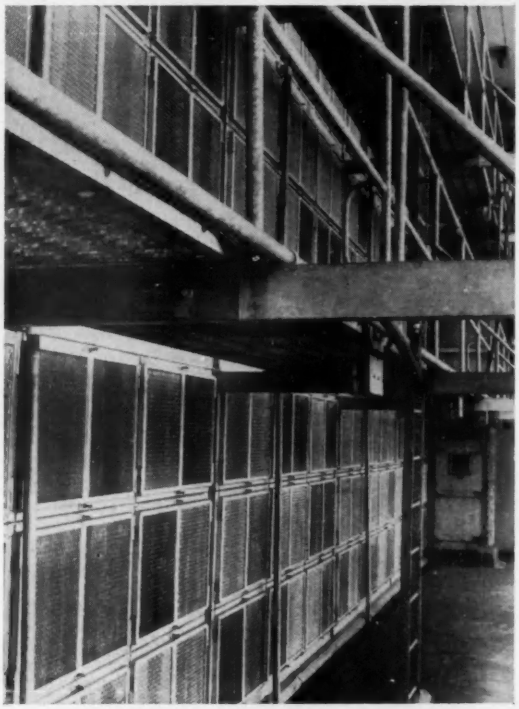
Air Filtration for High Altitude Engine Testing Plant

IN our report of the opening of the high altitude aero engine testing plant of Rolls-Royce, Ltd., at Derby (*Electrical Review*, 10th October) brief mention was made of the air filtration installation. Three filter plants have, in fact, been installed and are amongst the largest yet erected in this country. One plant supplies air directly to the aircraft engine under test, another supplies air to the compressor system in the input building and the third provides air for the main compressor system in the exhauster building. The total volume of air handled by these three electrostatic "Precipitron" air filter plants is 704,000 cu ft/min at a design efficiency of 85 per cent.

The largest of these plants is 45ft wide by 18ft high and walkways are provided at 6ft and 12ft levels on both the inlet and outlet sides of the filter bank to assist in general maintenance (Fig. 1). For convenience, the plant is divided into five sections, each receiving its h.t. supply from a separate power pack. This permits one section to be shut down in the event of a fault without affecting the remainder of the plant. All access doors to the filter chamber are mechanically and electrically interlocked with the power packs to prevent entry to the filter until all h.t. potentials have been switched off and the h.t. supply terminals connected to earth.

The operation of an electrostatic air filter depends upon the attraction of charged dust particles to electrodes of opposite polarity. In the "Precipitron" air filter, made in this country by the Sturtevant Engineering Co., Ltd., under an exclusive licence from the Westinghouse Electric International Co., U.S.A., a double voltage system is employed. A very high collection efficiency is obtained by greatly increasing the natural charge of the dust particles and then passing them into an entirely separate section where the electrostatic collection forces are maintained at a maximum under all conditions. The "Precipitron" cell containing the ioniser and collector plate sections is shown in Fig. 2. Any number of these units can be built up to form a filter of the required size. The corrosive nature of atmospheric dust necessitates the selection of suitable materials for the manufacture of the cell. The cell illustrated is manufactured from high-grade aluminium alloy and stainless steel and porcelain for auxiliary items.

Fig. 1.—General view of the "Precipitron" air filter



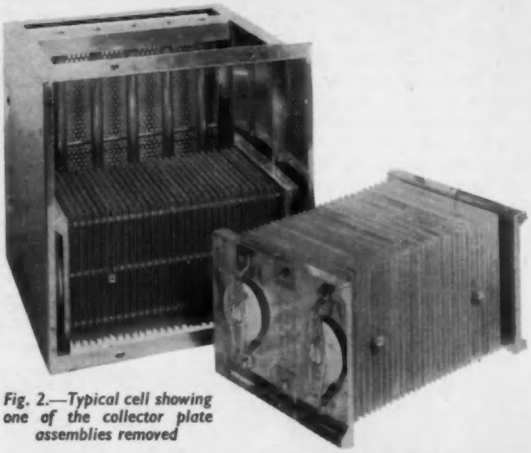


Fig. 2.—Typical cell showing one of the collector plate assemblies removed

The ioniser section consists of relatively fine wires positively charged at about 13 kV and suspended between tubes which are at zero potential. The air surrounding the ionising wires is subject to an intense electrical stress and electrons are detached from the air molecules and attracted to the positively charged wires. The air molecules are thus left positively charged or ionised and are attracted to the tubes which are at earth potential. Between the wires and the tubes, therefore, a dense and continuous stream of ions is established, and the ions attach themselves to the uncharged dust particles as they pass between the tubes. Immediately after the ioniser section is the collector system comprising assemblies of closely spaced flat plates of sufficient proportions to retain very large dust quantities, and also to ensure that all particles ionised are arrested in the collection plates. The positive plates of these assemblies are charged to about 6 kV with a plate at earth potential between each pair of charged plates. The positively charged dust particles are repelled by the charged plates and attracted by the earth plates. Little maintenance is required other than the periodic washing of the collected dust from the filter units. The power consumption for energising the cells on the plant for the exhauster building is equivalent to approximately 11 W for each 1,000 cu ft of air filtered.

DOMESTIC ELECTRICAL EQUIPMENT

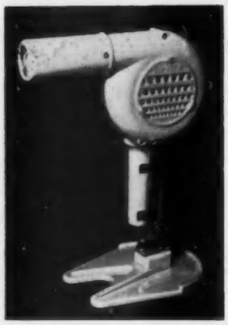
HAIR DRYERS

DURING the next few weeks sales of electric hair dryers will rapidly increase, reaching a peak around Christmas. The hair dryer is, of course, a pleasing and acceptable gift from the feminine point of view and the fact that most models can be purchased at a price in the region of £4 to £5 explains its popularity as a present.

There are upwards of a dozen different makes on the market and although each manufacturer offers his own individual design the majority of hair dryers are basically the same, consisting of a plastic moulding which houses the fan motor and heating elements. The average loading is in the region of 400/500 W, and the weight, an important factor, varies between 1¼ and 2½ lb. Hair dryers can also be obtained with stands, as extras, while other models, such as the Hawkins " Supreme " and " Fair Lady " or the Pifco model 1050, are provided with a plastic hood attachment that enables the hair to be dried in less time and with greater ease. As far as we are aware no actual new models have been introduced since we last dealt with this subject, the only change being the increase in the number of models that are now being produced in such pastel shades as blue, pink, green, etc., after accepting ivory or white as the appropriate colour for so many years.

Manufacturer	Name or Model	Weight	Element Loading	Motor Loading	Special Features	Finish	Price (excl. tax)	Purchase Tax
BESTFREND ELECTRICAL CO., LTD., **Diceland Works,** **Banstead,** **Surrey.**	" Mitey "	1 lb	350 W	30 W	Lightweight, small size	Ivory, pink or blue Bakelite	£2 9 6 (in carton) £2 12 6 (in wallet)	£0 10 11 £0 11 6
	" Permaster " Model " C "	2¼ lb	400 W	30 W	For professional use, rubber buffer strip	Chromium on copper body, Bakelite handle	£2 19 6	£0 13 0
	" Consort "	1½ lb	400 W	30 W	Built-in mirror	Ivory Bakelite, red and blue switches	£2 17 6	£0 12 6
BROWN BROTHERS LTD., **Great Eastern Street,** **London, E.C.2.**	" Duco Boudoir "	3 lb	500 W	50 W	Streamlined shockproof case. Stand 16s extra plus 1s 9d P.T.	Peach Bakelite	£3 4 0 (peach) £0 5 6 (extra for T.V. suppressed models)	£0 14 5 £0 0 8
	" Duco Favourite "	2 lb	375 W	25 W	Lightweight a.c. only	Peach	£2 14 0	£0 11 10
BYLOCK ELECTRIC, LTD., **109, South Street,** **Ponders End,** **Middlesex.**	" Dryad "	2 lb	400 W	25 W	Price includes stand available in ivory, pink and blue pastel shades	Moulded in ivory semi-translucent plastic	£2 17 6	£0 12 6
	" Streamline "	2¼ lb	500 W	50 W	Stand 17s 6d extra plus 3s 10d P.T.	Pressed metal body, chromium plated	£3 19 6	£0 17 5
	" Queen "	2¼ lb	500 W	50 W	Stand 17s 6d extra plus 3s 10d P.T.	White Bakelite	£3 16 6	£0 16 10
	" Simoom "	2½ lb	500 W	50 W	Stand 17s 6d extra plus 3s 10d P.T.	Walnut mottled Bakelite	£3 9 6	£0 15 3
	" Zephyr "	2¼ lb	500 W	50 W	Stand 17s 6d extra plus 3s 10d P.T.	Metal body sprayed in lavender, turquoise or blue	£3 9 6	£0 15 3
	" Simoom Gem "	2¼ lb	500 W	50 W	Stand 17s 6d extra plus 3s 10d P.T.	Moulded body in pastel colours	£3 9 6	£0 15 3
ELECTROTHERMAL ENGINEERING, LTD., **270, Neville Road** **London, E.7.**	" Solis " 54	1⅛ lb	400 W	—	With stand, suppressed	Ivory plastic	£3 2 7	£0 14 1
	" Solis " 97	1¼ lb	350 W	—	Unusual tubular design, suppressed	Ivory plastic	£3 6 4	£0 14 11
	" Solis " 99	1⅛ lb	210 W	—	Unusual tubular design, fitted waving comb, suppressed	Ivory plastic	£7 2 6	£1 12 1
	" Solis " 105	1¾ lb	550 W	—	Stand and mouthpiece extra, suppressed	Ivory plastic	£3 16 0	£0 17 1
	" Solis " 106	1¾ lb	750 W	—	4-heat control with mouthpiece, stand extra, suppressed	Ivory plastic	£7 10 9	£1 13 11
FALK, STADELMANN & CO., LTD., **91, Farringdon Road,** **London, E.C.1.**	" U.95731 "	1 lb	350 W	30 W	Available in leather pouch for travelling, suppressed	Blue, pink or cream	£2 12 6 £2 9 6 (without pouch)	£0 12 2 £0 10 11

Manufacturer	Name or Model	Weight	Element Loading	Motor Loading	Special Features	Finish	Price (excl. tax)	Purchase Tax
JOHN A. FRANSEN, LTD., **Northwood Hills,** **Middlesex.**	" Forfex "	2 lb	750 W	80 W	Built for professional use, cold plus 3-heat air control	Maroon	£9 1 3	£2 3 6
GENERAL ELECTRIC CO., LTD., **Magnet House,** **Kingsway,** **London, W.C.2.**	" DM395 "	2 lb	515 W	35 W	Radio and T.V. suppressed. Stand 16s 3d extra plus 1s 9d P.T.	Cream plastic	£4 8 2	£0 19 4
	" DM397 "	2 lb	370 W	30 W	Radio and T.V. suppressed. Stand 4s 11d extra plus 7d P.T.	Honeysuckle and maroon plastic	£2 14 6	£0 12 0
L. G. HAWKINS & CO., LTD., **30-35, Drury Lane,** **London, W.C.2.**	" Supreme " L.G.H.95722	2 lb 6 oz	500 W	50 W	Radio and T.V. suppressed. Hair drying attachment £1 13s 4d extra plus 3s 8d P.T. Stand 16s 6d plus 2s P.T.	Ivory Bakelite	£4 11 5	£1 0 0
	" Fair Lady " L.G.H.572	1 lb 7 oz	350 W	50 W	Radio and T.V. suppressed. Complete with plastic hood and presentation case	Ivory, green, pink or blue	£4 1 7	£0 17 11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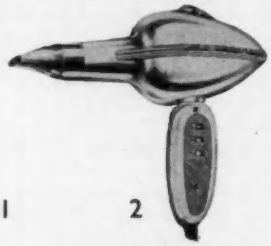
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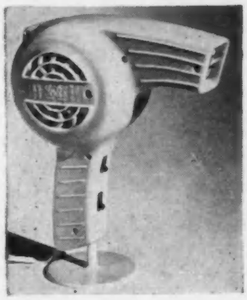
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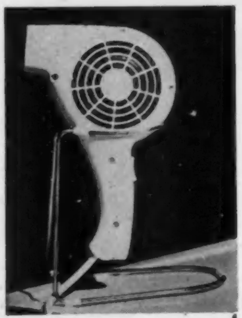
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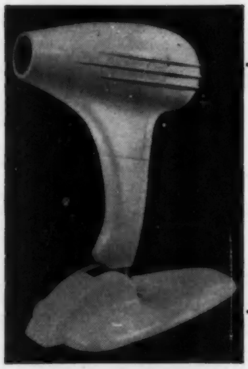
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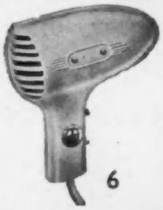
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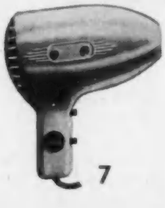
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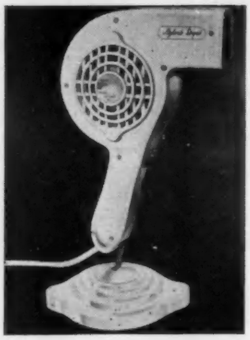
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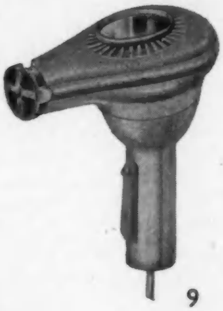
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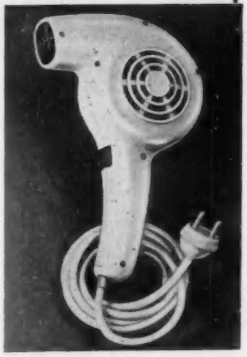
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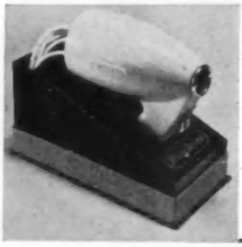
1. *L. G. Hawkins "Supreme" hair dryer mounted on stand*
2. *Fransen "Forfex"*
3. *Electrothermal Engineering "Solis" 54*
4. *G.E.C. model DM.397 with stand*
5. *G.E.C model DM.395 with stand*
6. *Bestfrend "Mitey" lightweight model*
7. *Falk, Stadelmann model U.95731 lightweight dryer*
8. *Bylock "Dryad"*
9. *Bestfrend "Consort"*
10. *Brown Brothers "Duco Favourite"*

Manufacturer	Name or Model	Weight	Element Loading	Motor Loading	Special Features	Finish	Price (excl. tax)	Purchase Tax
HILLMAN ELECTRIC MOTORS, LTD., Crane Grove, Highbury, N.7.	" Hillman "	1 lb 12 oz	500 W	20 W	—	Ivory or cream	£3 0 0	£0 12 9
MORPHY-RICHARDS, LTD., 50, Conduit Street, London, W.1.	HDA/2	1 lb 11 oz	400 W	25 W	Capacitor induction motor, heater cut-out switch. Stand 5s extra plus 7d P.T.	Ivory plastic	£2 14 6	£0 11 10
ORMOND ENGINEERING CO., LTD., Rosebery Avenue, London, E.C.1.	" E.1022 "	2 lb (3½ lb in casket)	500 W	50 W	Stand, mirror and comb	Walnut (*a*) or ivory (*b*)	£2 18 0 (*a*) £4 3 0 (*a*) (in casket) £3 3 0 (*b*) £4 10 9 (*b*) (in casket)	£0 12 9 £0 18 2 £0 13 10 £0 19 11
PIFCO, LTD., Watling Street, Manchester, 4.	" Pifco " 1050	2 lb	500 W	50 W	Stand 18s 6d plus 2s P.T. Hood 8s 1d plus 1s 10d P.T.	Ivory, pink, green, blue or lilac	£3 3 0	£0 13 9
SIROMA ENGINEERING CO., LTD., North Acton Road, Harlesden, N.W.10.	HD40	2 lb	375 W	25 W	A.c. only. Stand 16s extra plus 1s 9d P.T.	Peach plastic	£2 14 0	£0 11 10
SOUTHERN AIRFRAME PRODUCTS, LTD., 78, Buckingham Gate, London, S.W.1.	" S.A."	2 lb 4 oz	440 W	40 W	Metal casing, rubber encased handle. Stand £1 extra	Cream crackle	£5 0 0	£1 3 2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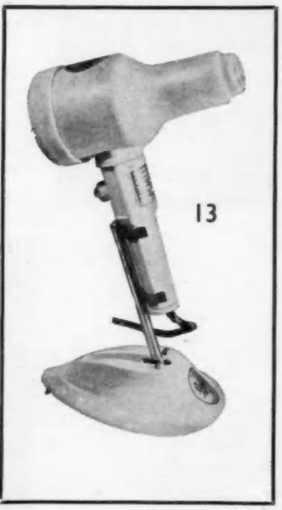
11. *L. G. Hawkins " Fair Lady "*
12. *Hillman hair dryer*
13. *Bylock " Queen "*
14. *Siroma model HD.40*
15. *Southern Airframe's metal cased hair dryer mounted on stand*
16. *Morphy-Richards model HDA/2 dryer on stand*
17. *Ormond model E.1022*
18. *Pifco hair dryer in case*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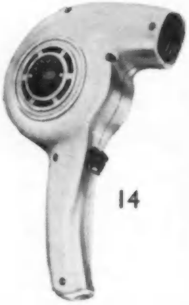
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Refrigerator Production

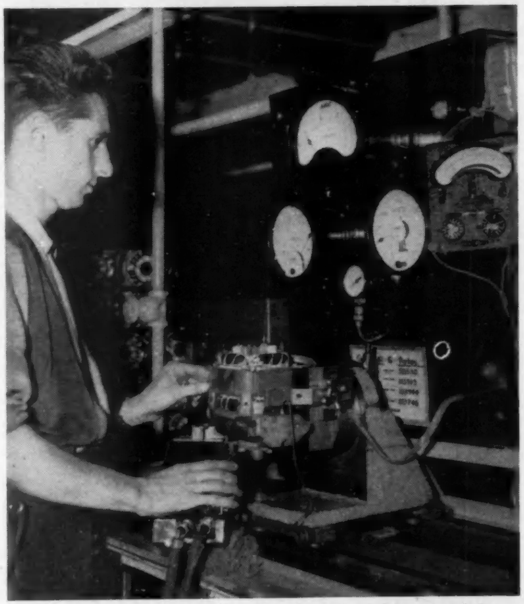
KELVINATOR'S NEW BROMBOROUGH FACTORY

IT is estimated that only 12 per cent of the homes in this country have refrigerators and that the majority of domestic refrigerators are bought during the three-month period May-July. Compared with other countries these figures are most unfavourable and as a result eight of the leading domestic refrigerator manufacturers in Great Britain formed the Domestic Refrigeration Development Committee (DoRDeC). The Committee was set up in May, 1956, and since that time has directed several publicity campaigns, the chief of which has been the attempt to instil into the minds of the public the benefits and economies of a refrigerator and the importance of its use during the winter months as well as in summer.

The latest figures issued by the British Refrigeration Association are, however, more encouraging and show that more than a third of the domestic refrigerators bought during the year are purchased in the six months from October to March.

Recently, DoRDeC arranged a Press visit to the newly completed factory of Kelvinator, Ltd., at Bromborough, Cheshire, which is of special interest because it is the largest factory to be constructed by the Government for lease to private industry. It has a floor space of 320,000 sq ft and replaces the company's original refrigerator factory at Crewe which was destroyed by fire two years ago. The employees total about 1,000. Owing to the housing shortage, a small nucleus of trained workers and staff are still brought by coach daily from Crewe, a return distance of 60 miles.

Because of the seasonal demand for refrigerators there are peak and off-peak production periods and during the time of our visit to the factory it was not operating at full output. It is, however, capable of producing 300 refrigerators during one eight-hour shift. Apart from domestic refrigerators (50 per cent of which go to the export market) the company produces several commercial types, including ice cream cabinets and drink cooling equipment.



The finished motor assembly of a domestic refrigerator being electrically tested at Kelvinator's Bromborough factory

During the short time available we were able to follow the manufacturing progress of a refrigerator from the unloading of the raw materials and sheet steel to the final packing stage. Several large presses, including a 500 ton machine, are used to form the outer shell and back panel of the cabinets. These are then fitted together and in their rough state are passed to the metal finishing shop where a smooth surface is provided in preparation for painting.

The paint shop, to which the cabinet shells are transported by means of an overhead conveyor, is situated in a building isolated from the main factory. It was explained that the fire at the Crewe factory originated in the paint shop and it is obvious that the company is guarding against a further incident of this kind.

Before the application of the paint the cabinets undergo seven stages of pre-treatment, including treatment for the prevention of rust. After passing through the paint spraying booths, fed at the rate of 300 gal of white or cream paint per week from the paint mixing plant, the cabinets enter the drying ovens. Here they are subjected to a temperature of 300 deg F, the complete cycle of operations taking approximately 90 minutes.

Machine Shop

The cylinder blocks used in the manufacture of the compressors are received at the factory in the form of rough castings. In the machine shop they are machined to within one ten-thousandth part of an inch and all work is individually tested. All the internal parts of the compressors are stored until required for assembly purposes in a special room at low humidity to prevent rust. Before actual assembly the parts are treated in a Kerry's automatic ultrasonic cleaning plant. The motor assemblies are all subjected to a series of electrical tests and finally, as a complete unit (condenser, evaporator and compressor), the whole is charged with gas and oil and tested for noise and leaks. Each unit is run for one hour before being fitted into the refrigerator cabinet.

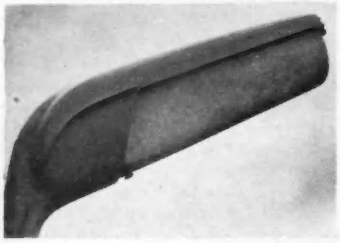
Final assembly of the refrigerator follows, involving the fitting of a 4in thick " Fibreglass " lining, insertion of the cabinet interior, and the fitting out of the interior. The inner door of the refrigerator is a one-piece plastic moulding and all such mouldings are stamped out as required on the site. The machine used for this purpose operates from a 415 V, three-phase supply, has a heater loading of 40 kW, and produces a rigid door interior from a single plastic sheet within approximately two minutes.

At a meeting in the company's boardroom at the conclusion of the visit Mr. D. A. Welch, sales manager, Kelvinator Domestic Appliances, hinted that long-term plans of the company would probably include the manufacture of other domestic appliances, including home laundry equipment.

NEW ELECTRICAL EQUIPMENT

Street Lighting Units

Street lighting units made entirely from polyester-glass are now being manufactured by JAMES WHITSON & CO., LTD., West Drayton, Middlesex. Each fitting is moulded in two parts with "Cellobond" polyester resins and glass fibre and consists of the pigmented body with a translucent bowl. It replaces the conventional metal and glass combination, is said to be extremely strong and will withstand severe climatic conditions. No surface protection is required as it will not corrode, and no maintenance is necessary.



Typical polyester-glass street lighting unit (James Whitson & Co.)

Units measuring 2ft and 4ft are available, each of which contains three 40 W fluorescent tubes. Light is diffused over a wide area and light transmission through the laminate is approximately 82 per cent.

Motor Control Gear

A range of totally enclosed direct-on-line motor starters up to 60 h.p. and star-delta starters up to 100 h.p. has been introduced by LANCASHIRE DYNAMO NEVELIN, LTD., Oxted, Surrey. Both types are push-button operated and incorporate vertical action block type contactors with silver-to-silver double break contacts on each pole.

Ambient temperature compensated thermal type overload releases with trip adjustment are fitted and the star-delta unit has a transformer operated thermal timing relay with adjustable time delay. A four-pole off-load isolator with self-aligning pressure contacts can be incorporated, fully interlocked with the hinged cover and having a separate spring-loaded operating handle.

Auxiliary contacts, main and control circuit fuses and indicating lamps are among the accessories which can be provided if required. The starters are supplied in a variety of wall mounting enclosures, of sheet steel, cast iron or aluminium alloy construction, giving easy access to the components by the removal of only two screws.

Stand-off Insulator

Two additions to the range of 25 stand-off insulators, the type J, length $\frac{13}{32}$in, and the type J-S, length $\frac{15}{32}$in, are announced by JACKSON BROTHERS (LONDON), LTD., Kingsway, Waddon, Surrey. Both have V-shaped top terminals permitting rapid connection of two or more wires laid in the groove.

Battery Charging Plug

A new development in the form of a battery charging plug has been announced by NETTLE ACCESSORIES, LTD., Warren Street, Stockport, Cheshire. The plug is designed for insertion into 50 A 4-pin battery charging sockets and is produced in rubber and "Neoprene." It is of integrally moulded construction so that the pins and cable are moulded firmly and permanently into the body. This construction is claimed to provide a product which is virtually indestructible and in which the danger of internal corrosion or breakdown due to ingress of moisture through cable entries or joints in the casing is eliminated. The cable can be supplied in any specified length.

Crystal Clock

The type TSA 33 crystal clock is a compact portable frequency source of high accuracy. Switched standard output frequencies of 10 kc/s, 1 kc/s, 100 c/s and 50 c/s are available from a coaxial socket mounted on the front panel. The emitter follower output circuit incorporates a series resistance to prevent damage to the final transistor if the output is accidentally short-circuited.

Completely transistorised, the equipment incorporates plug-in stages and a high quality 50 c/s synchronous clock with seconds hand but, if desired, this clock may be omitted and a 12 V 50 c/s synchronous motor supplied for external use. The clock is accurate to within 1 sec per week and is housed in a case 12in by 8in by 7in with a light grey finish.

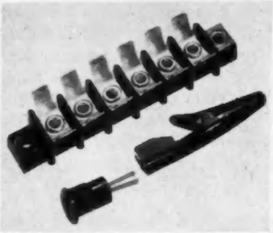
Models operating from 100/120 V or 200/250 V a.c. mains, 12 V accumulator, and external or internal batteries are available from VENNER ELECTRONICS, LTD., Kingston By-Pass, New Malden, Surrey, at prices ranging from £125 to £155.

Left: Lancashire Dynamo Nevelin direct-on-line motor starter

Right: Venner crystal clock

Terminal Block and Crocodile Clip

Two items are announced by CREATORS, LTD., Plansel Works, Sheerwater, Woking, Surrey. The Faston terminal block, specially designed for use with A-MP type crimped terminals, is available in various lengths up to 20 ways, each way accommodating an insert having from two to six tags. Various types of tag are available, and prices vary from 1s to 5s per block, according to quantity and type of tag.

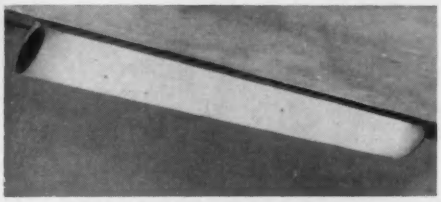


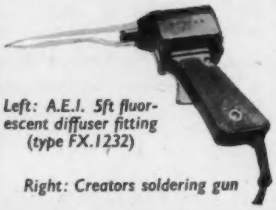
Creators terminal block and crocodile clip

The crocodile clip also introduced is made of polystyrene with a brass insert. Connections are made to the body of the clip by any standard single-stem plug, obviating the necessity for an insulated shroud. The overall length of the plastic rust-proof clip is 2in, and the clips are available in black or red priced at 1s each.

Fluorescent Diffuser Fitting

A 5ft fluorescent diffuser fitting has been added to the commercial range of fluorescent fittings manufactured by the A.E.I. LAMP & LIGHTING CO., LTD., Melton Road, Leicester. The F.1232 (with switch start) and FX.1232 (with switchless start) have a plain opal "Perspex" diffuser of elliptical section with black "Perspex" ends and fit the standard A.E.I. single- or twin-lamp fluorescent power pack. The diffuser is attached to the power pack by a wide lipped cover and it





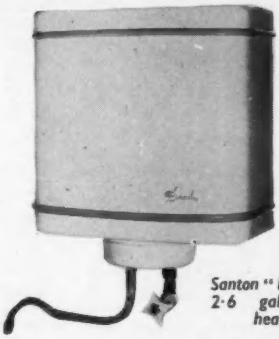
Left: A.E.I. 5ft fluorescent diffuser fitting (type FX.1232)

Right: Creators soldering gun

may be easily removed or allowed to hang freely from one side when relamping the fitting. The list price (excluding auxiliary gear and purchase tax) is £11 10s 4d for the single-lamp diffuser and £13 10s 8d for the twin-lamp diffuser.

Water Heater

A new water heater, the "Lincoln," of pleasing contemporary design, is now being produced by SANTON, LTD., Somerton Works, Newport, Mon. It has a capacity of 2·6 gal and the standard loading, at 240 V, is 2 kW. The outer casing of the heater is of "Stelvetite," a new plastic coated steel material which has recently been introduced by John Summers & Son, Ltd., of Chester. This is a tough abrasion-resistant coating seven times the thickness of paint with a high electrical resistance, and it withstands acids and alkalis.



Santon "Lincoln" 2·6 gal water heater

The finish of the heater is in white, honeysuckle cream, or light green, with bands of contrasting colours. All the heaters are suitable for right- or left-hand fixing. The price is £11 17s 6d plus £2 15s 7d purchase tax in the United Kingdom.

"Dry" Marker

OFREX, LTD., Ofrex House, Stephen Street, London, W.1, has introduced a controlled flow pen marker for writing, painting or stencilling on practically any kind of surface. It is likely to be useful in stores and drawing offices as well as other departments.

The pen is valveless and uses the company's "Rapidry" ink, available in various colours. A variety of shapes of compressed felt nibs is provided.

Lightweight Soldering Gun

A trigger-operated lightweight soldering gun weighing only 1½ lb and priced at £2 5s complete with two yards of flex is announced by CREATORS, LTD., Plansel Works, Sheerwater, Woking, Surrey. A transformer is built into the handle, providing a reduced safe operating voltage, and a pilot bulb illuminates the object to be soldered. The time required to reach soldering temperature is approximately seven seconds.

Germanium Diode

The type VA 719 germanium diode announced by the ENGLISH ELECTRIC VALVE CO., LTD., Chelmsford, Essex, has the same dimensions as the type VA713 and a current rating of 20 A at 35 deg C. It is available in single units or stacks with outputs up to 130 A at 223 V d.c.

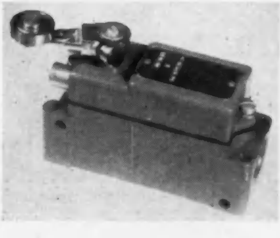
Kettle Elements

Improved manufacturing techniques have been evolved by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2, for their "Superspeed" kettle elements. The element tube has been reduced in size and formed into a "D" section near the centre, thus providing greater contact area with the element head. There is very rapid heat transfer to the cut-out mechanism and the modified shape gives a lower cross section. As a result of these improvements the cut-out operates under boil-dry conditions with less of the element tube exposed above water level. The total element weight has been reduced by more than 20 per cent.

Limit Switch Roller Arms

Roller arms incorporating "life-time" lubricated ball bearings have recently been introduced by SQUARE D, LTD., 100, Aldersgate Street, London, E.C.1, as an addition to their class 9007, type A, range of limit switches. These arms are fully interchangeable with standard types and are designed for high production applications on machine tools and similar machinery involving continuous rolling contact of the arms with the cam track. The roller diameter for all models is ¾in, and arms are available in 1⅜, 2, 2½ and 3in lengths.

Ball bearing roller arm on Square D limit switch



Display Lighting Fittings

A new range of shop window display lighting fittings has been introduced by FALK, STADELMANN & CO., LTD., 91, Farringdon Road, London, E.C.1. The first of these is the "Ludlow," a conical reflector fitting for side or top entry suitable for a 150 W internally silvered e.s. spotlight lamp. It comprises a heavy-gauge spun aluminium outer housing with brass plated universal jointed back plate. It has a black anodised finish. The "Ludlow Minor" is a smaller version for use with a 75 or 100 W internally silvered b.c. lamp.

Another fitting, the "Handley," is identical to the "Ludlow" but includes a highly polished anodic aluminium internally mounting detachable reflector fitting within the outer housing and around the lamp enabling the use of 150 W g.l.s. e.s. lamps. The "Handley Minor," for 75/100 W g.l.s. b.c. lamps, is a smaller model of this fitting.

The "Bantry" is a surface mounting adjustable spotlight fitting comprising a heavy-gauge spun aluminium black anodised lampholder housing with brass plated universal jointed back plate. It is suitable for a 150 W internally silvered e.s. spotlight lamp. The "Bantry Minor" is suitable for a 75/100 W internally silvered b.c. spotlight lamp.

Travel Iron

The "Globe Trotter" electric travel iron, obtainable from FALK, STADELMANN & CO., LTD., 91, Farringdon Road, London, E.C.1, is now available with a set of four adaptors which, together with a master plug, enables it to be used from practically any type of power or lighting socket. The iron has a full-sized sole plate and fold-flat handle and can be used on any voltage between 110 and 250, either a.c. or d.c. The price, complete with adaptors, master plug and 9ft of flexible in a leatherette case, is £3 7s 6d including purchase tax.

Falks "Globe Trotter" travel iron

Financial Section

STOCKS and SHARES

ACTIVITY has remained at a good level in the industrial markets of the Stock Exchange, where interest centred in particular for a time upon the shares of companies which manufacture or sell the domestic appliances, cars and other goods affected most by the removal of all restrictions on hire-purchase deposits. From more general points of view also, this further evidence of the Government's concern to encourage the re-expansion of trade helped to sustain investment confidence. The gilt-edged market has been rather out of the picture for some time, but prices are steady.

Hire-Purchase Goods

Hoover £1 shares were prominent in the general advance of investments regarded as being favoured by the latest ruling on hire-purchase transactions. At 50s 6d, they showed a gain of 1s 6d on the week. There was a very strong demand, attributed partly to American sources, for Electric & Musical Industries 10s shares, which gained 5s 6d in moving up to 53s. Another striking move was the rise of 4s 9d to 33s 9d in Vactric 5s shares: this company has called a meeting for 25th November as a preliminary to the payment of the 8s 6d per share to be distributed tax-free to shareholders out of the proceeds from the sale of a subsidiary. Decca "A" shares rose to 30s, and others to improve included Burco Dean, Bulpitts and Berry's Electric.

Price Changes

In advance of the final dividend declarations and financial results, both J. Lucas and S. Smith were well supported up to 41s 9d and 11s respectively. The spectacular rise in London Electric Wire was resumed, the price reaching 63s 9d (against 48s six weeks ago) to the accompaniment of various rumours of impending developments. G.E.C. at 37s 6d, and A.E.I. at 55s, were both better, and the latter's change was reflected in the rise of W. T. Henley's to 20s: holders of the latter have until 10th November to accept the offer of an exchange into A.E.I. shares. Aerialite were notably good at 8s 6d and other gains worthy of note included those in Taylor Tunnicliff, Pyrotenax, Automatic Telephone and Metal Industries. Crabtree Electric moved up to 32s before the publication of the annual results, and there were further gains in shares with commercial television interests on the strength of the £5 million trading profit reported by Associated-Rediffusion.

Crompton Parkinson Results

The increases in both profits and dividends announced by Crompton Parkinson for the year ended last June apparently disappointed the more extravagant estimates on which some of the previous buying of the 5s shares had been based, for there was a subsequent reaction in the price from 13s to 12s 6d. Allowing for the increase in the ordinary capital by a one-for-two

Price Changes in

Company or Board	Nom. Value	Middle price 3rd Nov.	Week's Rise or Fall	Dividend		Yield %	1958	
				Pre-vious	Last		High-est	Low-est
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	76½		3	3	3 18 6	76½	72
Brit. Elec. 1974/77	100	73½		3	3	4 1 9	73½	68½
Brit. Elec. 1976/79	100	77½	+½	3½	3½	4 10 9	78½	72
Brit. Elec. 1974/79	100	87		4¼	4¼	4 17 9	87½	82¾
Overseas Electric Supply								
Calcutta Elec.	£1	16/6		6·8†	7†	8 9 9†	17/6	15/-
East African Power	£1	23/-		7½	8	6 19 3	23/-	17/6
Nigerian Elec.	£1	14/6		10	10	13 16 0	17/-	12/6
Perak Hydro-Elec.	£1	14/-		12½	10	14 5 9	15/6	13/6
Electrical Shares								
Aberdare Holdings	5/-	13/6		17½	17½	6 9 9	13/9	9/9
Aerialite	1/-	8/6	+1/3	48	51½	6 1 3	8/6	5/1
Allen, W. H.	£1	43/9		10	11	5 0 6	43/9	32/9
Anglo-Portuguese Tel.	£1	27/9	−6d	8	9	6 9 9	29/3	19/9
Aron Elec. Ord.	£1	60/-		15	15	5 0 0	60/-	53/-
Assoc. Elec. Ord.	£1	55/-	+1/3	15	15	5 9 0	55/-	46/6
Automatic Tel. & El.	£1	72/6	+2/6	17	17	4 13 9	72/6	57/-
Babcock & Wilcox	£1	52/6		15	13‡	4 19 0	54/6	41/9
Bakelite	10/-	23/-		15	15	6 10 6	23/-	17/6
Baldwin, H. J.	2/-	3/-	+3d	20	20	—	3/9	2/6
Berry's Electric	5/-	9/3	+9d	10	10	5 8 0	9/3	5/9
British Aluminium	£1	54/6	+2/6	12	12	4 8 0	55/-	37/-
Brit. Elec. Traction:								
Def. Ord. "A"	5/-	37/6	+3/6	25	25	3 6 9	37/6	19/6
B.I. Callender's	£1	48/6	−6d	12½	12½	5 3 0	49/-	38/9
B.I. Callender's 6% Pref. ...	£1	20/-		6	6	6 0 0	20/3	19/-
British Tabulating	£1	55/-	−6d	9	10	3 12 9	57/6	38/6
British Thermostat	5/-	34/9		25	30	4 6 3	35/3	19/9
British Vac. Cleaner	5/-	4/3		10	10	5 17 9*	4/3	2/3
Brook Motors	10/-	49/6		25	25	—	50/-	33/3
Bulgin, A. F.	1/-	7/-		40	45	6 8 6	7/-	4/7
Bulpitts	5/-	9/6	+3d	—	12½‡	6 11 6	9/6	7/3
Burco Dean	5/-	10/9	+1/-	20	22½	6 19 6*	10/9	7/9
Cable & Wireless:								
Ord.	5/-	12/9	+3d	10	10‡*	3 18 6	12/9	8/-
4% Loan	100	94		4	4	4 4 0	94½	89
Chloride El. Storage "A" ...	£1	65/-	+9d	17½	17½	5 7 9	66/3	55/6
Clarke Chapman	£1	64/3		27½	27½	4 5 6*	72/6	55/-
Cole, E. K....	5/-	17/3	+3d	17½	17½	5 1 6	18/-	15/3
Cossor, A. C.	5/-	5/3		2½	Nil	Nil	6/-	4/4
Crabtree	10/-	32/-	+6d	20	20	6 5 0	32/-	24/4
Crompton Parkinson	5/-	12/6	−6d	16	12*	4 16 0	13/6	8/3
De La Rue	10/-	30/3	+9d	35	17½*	5 15 9	30/3	20/9
Decca "A"	4/-	30/-	+1/3	43¾	43¾	5 16 9	30/9	21/3
Desoutter	5/-	16/6		32½	18¾*	5 13 9	16/6	13/6
Dewhurst	2/-	8/9	−3d	16¼	20	4 11 6	9/-	6/9
Dictograph Tel.	2/-	7/3		20	20*	5 10 3	7/3	4/7
Dubilier Condenser	1/-	3/6		30	20*	5 14 3	4/3	3/1
Duport	5/-	10/9		25	25	5 16 3*	10/9	7/9
E.M.I.	10/-	53/-	+5/6	15	15	—	53/-	27/6
Electrical Components	5/-	9/-		12½	12½	6 19 0	9/9	7/-
Elec. Construction	£1	28/9	+1/3	8½	8½	5 18 3	28/9	21/-
Elliott-Automation	5/-	19/-	+9d	—	10‡	2 12 9	19/9	11/6
Enfield Cable Ord.	£1	17/-		Nil	2½	2 18 9	18/9	10/9
English Electric	£1	57/6		14	14	4 17 3	60/-	44/-
English Electric 3¾% Pref. ...	£1	12/6		3¾	3¾	6 0 0	12/6	11/9
Ericsson Tel.	5/-	24/9	−6d	22†	12*†	4 4 0	25/3	17/6
Ever Ready	5/-	20/9		37½	20*	4 16 6	21/3	13/9
Falk Stadelmann	£1	40/-	−5/6	17½	15	7 10 0	46/3	35/-

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.
* After scrip issue. † Free of income tax. ‡ Dividend indicated.

scrip issue, the total distribution of 12 per cent represents an improvement of 1½ per cent on the previous payment. It appears, from the preliminary statement, to be covered 2½ times over by the net profit, which comes out slightly higher, at £1·1 million, after a heavier tax charge of £1·5 million. The yield on the shares goes up to over 4¾ per cent.

Falk, Stadelmann Dividend

In the case also of Falk, Stadelmann £1 shares there was a substantial rise in price in anticipation of the annual results and a sharp reverse after the announcement of a contraction of profits in respect of the year to last March, and of a reduction in the final dividend which brings the total down from 17½ to 15 per cent. Shareholders had been advised previously of difficult conditions affecting some sides of the business, and the latest results are said by the chairman to have been affected by reorganisation expenses. Turnover in the first half of the current year has kept up well and conditions in the second half are expected to improve.

Electrical Investments

Company or Board	Nom. Value	Middle price 3rd Nov.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield % £	s	d	1958 Highest	1958 Lowest
Electrical Shares—continued										
G.E.C. Ord.	£1	37/6	+9d	12½	10	5	6	9	40/-	29/3
G.E.C. 6½% Pref.	£1	21/6		6½	6½	6	1	0	21/6	20/3
General Cables	5/-	9/9		30	24		—		11/9	8/3
Greenwood & Batley	£1	52/6		17½	20	7	12	6	52/6	45/-
Hackbridge Holdings	5/-	14/3		20	20	7	0	3	14/9	7/6
Hackbridge & Hewittic	5/-	14/6		20	20	6	18	0	14/6	9/7
Head Wrightson	5/-	26/-	+2/3	22½	17½*	3	7	3	26/-	16/9
Heatrae	2/-	7/3		15	20	5	10	3	7/3	4/-
Henley's	10/-	20/-	+1/-	11½	11½	5	10	0	20/-	10/6
Holophane	5/-	15/-	+6d	37½	22½*	7	10	0	15/3	12/6
Hoover	5/-	50/6	+1/6	50	50	4	19	0	50/6	31/-
I.C.I.	£1	36/-	+1/6	10	12	4	9	0*	36/-	23/9
Intl. Combustion	5/-	27/6		22½	25	4	11	0	27/6	19/3
Johnson & Phillips	£1	20/6	−1/3	10	5	4	17	6	25/-	15/-
Lancashire Dynamo	£1	40/-		11	11	5	10	0	40/-	28/6
Laurence Scott	5/-	16/9		15	15	4	9	6	16/9	12/6
Lister, R. A.	£1	31/6	+6d	10	10	6	7	0	31/6	23/-
London Elec. Wire	£1	63/9	+2/6	12½	12½	3	18	6	63/9	39/6
Lucas, J.	£1	41/9	+9d	7½	7½	3	11	9	41/9	27/9
Marconi Marine	£1	36/3		10	10	5	10	3	36/3	29/-
Marryat & Scott	2/-	7/6		35	37½	5	0	0*	7/7	5/3
Mather & Platt	£1	48/9	+1/3	15	15	4	2	0*	48/9	29/6
Metal Industries	£1	43/6	+1/6	9	14	6	8	6	43/6	22/9
Midland Elec. Mfg.	£1	60/-	+1/3	12½	12½		—		60/-	44/-
Morphy-Richards	4/-	18/9		20	20	4	5	3	19/-	14/6
Murex	£1	54/3	−9d	20	17½	6	9	0	59/3	48/-
Newman Ind.	2/-	2/9		10	10	7	5	6	2/9	2/3
Oldham & Son	1/-	3/-		17½	17½	5	16	9	3/-	2/3
Parsons, C. A.	£1	52/6		8¼	7½*	2	17	3	53/6	43/-
Plessey	10/-	70/-		30	30	4	5	9	72/6	55/-
Pye "A" Deferred	5/-	16/-		12½	12½	3	18	3	16/-	10/-
Pyrotenax	5/-	29/6	+9d	—	27½‡	4	13	3	30/6	27/6
Reyrolle	£1	88/9		17½	17½	3	19	0	88/9	73/6
Rheostatic	4/-	7/6		12½	12½	6	13	3	8/-	6/-
Richardsons Westgarth	10/-	15/3		16⅔	8⅓*	5	9	3	15/9	13/-
Scottish Cables	4/-	11/9		27½	27½	5	8	9*	11/9	7/-
Simon-Carves	5/-	28/9	−6d	20	25	4	7	0	29/3	22/6
Smith (England), S.	4/-	11/-	+6d	17½	20	3	12	9*	11/-	7/-
Southern Areas	£1	11/-	−1/-	7½	Nil		Nil		13/9	9/3
Strand Elec.	5/-	8/9	+6d	15	15	8	11	6	8/9	4/9
Sturtevant	5/-	17/9	+6d	15†	15†	4	4	6†	18/-	14/9
Sun Elec.	£1	60/-	+2/6	25	25	8	6	9	60/-	47/3
Switchgear & Cowans	5/-	8/6		25	22½	6	12	3*	8/9	4/6
Taylor Tunnicliff	5/-	17/3	+6d	15	17½	5	1	6	17/3	11/9
T.C.C.	10/-	37/6		25	25	6	13	3	38/6	32/6
T.C. & M.	£1	28/9	−1/-	8½	8½‡	5	18	3	30/-	20/-
Telephone Mfg.	5/-	5/6	−3d	10	10	9	1	9	5/9	4/6
Telephone Rentals	5/-	12/3		12½	12½	5	2	0	13/6	9/9
Thompson (John)	5/-	26/-	+6d	25	25	4	16	3	27/-	23/-
Thorn Elec. "A"	5/-	22/6		17½	17½	3	17	9	23/3	17/-
Thornycroft	£1	25/-		12½	7½	6	0	0	30/9	21/-
Tube Investments	£1	73/9	+2/6	15	17½	4	15	0	73/9	48/3
Vactric	5/-	33/9	+4/9	25	25		—		33/9	14/3
Veritys	5/-	5/3		12½	2½	2	7	6	6/9	5/3
Walsall Conduits	4/-	17/3	+6d	20	22½	5	4	3	17/3	11/-
Ward & Goldstone	5/-	33/-		40	25*	3	15	9	33/6	23/6
Watford	2/-	7/3		25	25	5	10	3*	7/3	4/-
Westinghouse	£1	41/9		18	10*	4	15	9	42/6	32/3
West, Allen	5/-	11/9		15	12½*		—		11/9	7/9
Wolf Electric	5/-	8/6		20	10*	5	17	9	9/-	6/9

Ex-Bonus

Both the Allen West and Switchgear & Cowans companies have now distributed their capitalisation issues, and the shares are accordingly quoted in "x.c." form at 11s 9d and 8s 6d respectively. Allen West are giving shareholders one new 5s share for every five units held, and have forecast a final dividend of 7½ per cent on the ordinary capital so increased to £2,737,800. Including the 5 per cent interim paid previously, this would give a total for the year equivalent to an increase of about 1¼ per cent on the last year's dividend, and would put the shares on a yield basis of 5 per cent. Switchgear & Cowans are doubling their ordinary capital, to £450,000, by a one-for-one share distribution. A dividend of half last year's rate of 22½ per cent would make the yield on the shares a fraction over 6½ per cent, but there has been an increase in the interim dividend for the current year.

Morphy-Richards

In his review accompanying the full annual report of Morphy-Richards, Mr. F. P. Bishop reports that the turnover of the group during the year ended last June expanded by 30 per cent, to £7·7 million, but that the improvement in the net profit, to £656,000, was limited to 9 per cent. There has been a considerable difference between the experience of the parent company, which earned lower profits despite a much larger turnover, and that of the Astral subsidiary, whose sales and profits were both more than doubled, and whose main difficulty now is in meeting the demand for its refrigerators. As reported previously, the ordinary dividend is being maintained for the second year running at 20 per cent. It is covered well over twice by earnings available, and gives a yield of 4¼ per cent on the 4s shares at a price of 18s 9d.

Superlamp Acquisition

Superlamp, Ltd., has acquired the Progress Cables & Accessories Co., Ltd. Mr. E. C. Darby will continue as joint managing director of Progress Cables. From 24th November the head offices of Superlamp and Progress will be at 72, Eversholt Street, London, N.W.1 (telephone: Euston 9011).

REPORTS and DIVIDENDS

Falk, Stadelmann & Co., Ltd., report a group trading profit for the year ended 31st March last of £510,368, as compared with £679,344 for the preceding year, and after meeting all charges, including £174,884 for taxation, the net balance is £125,980 (against £211,731). It is proposed to pay a final dividend of 7½ per cent (against 10 per cent, making 15 per cent (17½ per cent) for the year, and to carry forward £458,028 (against £417,130 brought in).

In his statement, which has been circulated with the report and accounts, Mr. H. Falk (chairman and managing director) says that trading conditions during the year under review continued to be difficult and although some sections of the group maintained their contribution to profits, other sections suffered some contraction. The profit has been further decreased by the expenses of reorganisation in two sections of the group. This reorganisation is not quite complete and further but smaller expenses in this direction are being incurred during the current year. An agreement has been negotiated with an American company which should broaden still further the group's scope of manufacturing capacity.

The reduction in the sale of heating appliances was offset to some extent by increases in other sections of the business which maintained their position and enjoyed a satisfactory year. The company have again carried out numerous important schemes in the lighting field, both in Great Britain and overseas. Their new range of "Summit" fluorescent fittings is proving popular. The domestic electrical appliances section was very active. Export sales showed a further increase although margins continued to contract slightly. Apart from their traditional markets, they were successful in increasing exports to the United States and in obtaining an initial contract from China.

The reorganisation referred to last year in the electrical wiring accessories factory continued. The h.v. switchgear factory enjoyed another successful year's trading. A new auxiliary factory at Brackley was completed and brought into production during the year, and with the main factory at Banbury, this section is now fully equipped with modern plant. Competition, however, in this field has become keener, and whilst productive capacity is at present fully employed, orders received during the current year are less than for the year under review. The cable factories in London and Northern Ireland have also been fully employed. The company has a 49 per cent interest in the Wandleside Warren Wire Co., Ltd., which will manufacture a special type of cable and also carry out certain auxiliary processes in a new factory in Northern Ireland.

The lighting fittings factories again operated at maximum capacity. The branches in Australia and New Zealand have made encouraging progress, but the South African company has still failed to function satisfactorily and a loss for the year resulted. Turnover during the first half of the current year has been well maintained and Mr. Falk anticipates that trading conditions during the second half will improve.

Morphy-Richards, Ltd. — The financial results for the year ended 30th June last were given in our issue of 10th October. In his review of the year, which has been circulated with the report and accounts, Mr. F. P. Bishop (chairman) says that the parent company's results last year were adversely affected by the development costs of the new factory at St. Mary Cray and the introduction of new products which are not yet making their proper contribution to earnings. As a partial set-off to these unfavourable factors the figures for the year were improved by a special sales drive in June of heating appliances. While the parent company's turnover increased by nearly 17 per cent, trading profits were lower than in the previous year. Astral Equipment, Ltd., the principal subsidiary, on the other hand, more than fulfilled their hopes. The demand for refrigerators throughout the year exceeded productive capacity, even though they had the full benefit of the new factory at Dundee. The new spin dryer has also proved highly successful. Both turnover and trading profits of the Astral subsidiary more than doubled last year. The other recently acquired subsidiary, Yelsen, Ltd., has also made a useful contribution to output and profits. As a first step towards bringing the capital of Astral Equipment more in line with reality it is proposed to increase the authorised capital by £250,000 to £300,000, and the issued capital to £150,000 by capitalising £100,000 of the undivided profits.

With regard to the current and future outlook, comparing the four months June-September this year with the same four months of 1957, the parent company has an increase in sales of just over 2 per cent. So far as Astral is concerned, the problem is still one of inability to meet demand. In the course of the current year they expect to take possession of a further large extension to their factory at Dundee.

Turning to exports, the new company in the United States did well and made a useful contribution to group profits, but conditions in Canada and Australia proved difficult. There has also been some delay in the development of the new arrangements for local manufacture in South Africa, but the difficulties now appear to have been overcome. Export sales as a whole again showed only a small increase and this was due as much to economic conditions in many countries as to intensified competition. Sales to European countries were maintained largely by their successful entry into the German market through their newly established German associated company. They have recently set up their own sales company in Denmark. Import restrictions announced by the New Zealand Government have for the time being closed this market to manufactured goods from this country, but arrangements for the local manufacture of their products under licence by their New Zealand agents have already been made.

Crompton Parkinson, Ltd., has issued a preliminary statement of the financial results for the year ended 30th June last. This shows a group profit of £2,687,577, as compared with £2,543,504 for the preceding year. Taxation absorbs £1,527,380, stamp duty on increased capital £13,750, and specific reserves £34,018, leaving a net balance of £1,112,429 (against £1,059,247). From this is deducted minority interest and profits retained in subsidiary companies of £39,823 and redemption of sinking fund certificates £5,538, leaving £1,067,068 (£1,018,991) to be dealt with in the accounts of the parent company. It is proposed to pay a final ordinary dividend of 7 per cent, making 12 per cent for the year. The total distribution last year was 16 per cent before a free issue of one ordinary stock unit for every two held, that is to say, equivalent to 10⅔ per cent on the increased capital. A payment of £15,000 is made to the trustees of the central benevolent fund and, after adding £13,750 taxation and other provisions no longer required, the balance transferred to revenue reserve is £640,099 (against £644,621).

The British Electric Transformer Co., Ltd.—The net profit for the year to 30th June last is £83,849, as compared with £72,188 for 1956-57. It is proposed to pay a dividend for the year of 4s 3d per 5s ordinary share (against 3s 6d).

Simon-Carves, Ltd., have declared an interim dividend of 10 per cent (against 7½ per cent). The increase over the interim dividend paid in 1957 is intended to reduce the disparity between the interim and final dividends and does not indicate that the total for the year will be greater than the 25 per cent paid for 1957.

Scottish Cables (South Africa), Ltd. —The annual meeting was held on 31st October at Pietermaritzburg, Mr. D. G. Sutherland presiding, following the recent death of the chairman, Mr. W. Fraser. In the chairman's circulated statement, it was pointed out that the output was a record and the trading profit increased despite intensive competition and lower profit margins. The introduction of plastics and other synthetic materials called for continuous review, and while the conventional design of paper-insulated cable for underground distribution still held its place on both technical and economic considerations, the new materials becoming available had, for certain applications, decided advantages. The company had started the current year with reasonable order books.

The British Electric Resistance Co., Ltd., reports a net profit for the year to 31st July last of £25,006, as compared with £25,323 for the preceding year. Taxation absorbed £33,400. It is proposed to place £14,000 to reserves and to pay a final dividend of 15 per cent, maintaining the distribution for the year at 20 per cent. It is also proposed to make a one-for-two scrip issue. The balance carried forward is £10,688 (against £10,395 brought in.

Wilkins & Mitchell, Ltd.—Application lists opened and closed yesterday (Thursday) for a public issue of 1,062,696 ordinary 5s shares, making 3·36 million in issue, at a price of 8s per share. The issue is being made for the purpose of reducing indebtedness to bankers and creditors and to provide further working capital. It is being undertaken by Rowe & Pittman and firm applications have been received for 366,022 shares, which will be accepted in full. Preferential consideration was to be given to applications from employees.

W. Canning & Co., Ltd., have announced an interim dividend of 5 per cent (unchanged).

The Pressed Steel Co., Ltd., is paying an interim dividend of 7½ per cent (against 6 per cent), on increased capital.

Meters, Ltd., is maintaining its interim dividend at 2½ per cent.

Yarrow & Co., Ltd., propose to increase the capital from £600,000 to £750,000 by a scrip issue of 150,000 £1 ordinary shares. The new shares will not rank for any dividends for the year ended 30th June last.

The Atlas Electric & General Trust, Ltd., has declared an interim dividend of 4 per cent (against 3 per cent).

Bowthorpe Holdings, Ltd., is paying an interim dividend of 7 per cent (unchanged).

New Companies

Mardyke Electrics, Ltd.—Registered 29th September. Capital £2,000. Wholesale and retail manufacturers of and dealers in electrical, radio, electronic, mechanical and other devices, equipment or parts thereof, etc. Directors: W. B. Barton (governing director and chairman) and A. W. Barton. Regd. office: 96, Hotwell Road, Bristol, 8.

Bourne Electrical Engineering Co. (Birmingham), Ltd.—Registered 3rd October. Capital £4,000. Directors: A. C. Grubb, E. F. Gisbourn, A. G. Gisbourn and V. H. Green. Regd. office: 302, Warwick Road, Birmingham, 11.

Wharton Electronics, Ltd.—Registered 30th September. Capital £100. To acquire the business of Teleservice, Wharton Instrument Co., and De Querton Electronic Developments at Finchley Road, N.W.11; and to carry on the business of manufacturers, wholesalers and factors of general electrical equipment, etc. Directors: J. H. Wharton and B. J. Filmer. Regd. office: 1081, Finchley Road, N.W.11.

Electrical Sales (Liverpool), Ltd.—Registered 20th October. Capital £5,000. Manufacturers of and dealers in electrical installations, etc. Directors: F. Highcock, Mrs. Laura A. Highcock, F. R. W. White and R. G. Highcock. Regd. office: Berey's Buildings, George Street, Liverpool, 3.

S. W. Fletcher (Electric Motors), Ltd.—Registered 20th October. Capital £2,000. Electrical and mechanical engineers, etc. Directors: S. W. Fletcher and Mrs. Ethel A. Fletcher. Regd. office: 33, Eleanora Street, Stoke-on-Trent.

Tenkohm, Ltd.—Registered 21st October. Capital £100. Manufacturers of and dealers in electrical goods of all kinds, etc. Directors: J. P. Donegan and A. H. Stallion. Regd. office: 161a/166, Strand, W.C.2.

Domestic Appliances (Doncaster), Ltd.—Registered 2nd October. Capital £100. Electrical engineers, etc. Directors: J. W. Roberts and Beryl Roberts. Regd. office: 114, High Street, Bentley, Doncaster.

Industrialite, Ltd.—Registered 2nd October. Capital £100. Electrical and general engineers, etc. Directors: A. S. Haggis, H. G. A. Haggis and D. A. Haggis. Regd. office: 52, Manor Road, Wallington, Surrey.

Silvana Electronics, Ltd.—Registered 6th October. Capital £100. Manufacturers of and dealers in, hirers, repairers, storers and warehousers of radio and television sets, and electrical domestic equipment, etc. Directors: J. C. Arnold and Mrs. Sadie C. Arnold. Regd. office: 12, Lytton Road, New Barnet, Herts.

Tabletop Appliances, Ltd.—Registered 14th October. Capital £100. Manufacturers and repairers of, agents for and wholesale and retail dealers in electrical plant, machinery, fittings and accessories, artificial lighting apparatus, neon and other signs, radio and television sets, etc. Directors: A. L. Craven, G. Jater and D. C. Phipps. Regd. office: The Lye, St. Johns, Woking, Surrey.

Bankruptcies

W. W. Forbes and **A. C. Poole,** lately carrying on business in partnership as F.P. Radio Service, at 325, Lillie Road, Fulham, London, S.W.6, radio and electrical dealers.—First meeting (today) 7th November and public examination 4th December, both at Bankruptcy Buildings, Carey Street, London, W.C.2.

R. V. Gansell, 22a, King's Road, St. Leonards-on-Sea, trading as the Florentine Lamp Co., manufacturer of electric table lamps.—Public examination 16th December at the Town Hall, Hastings.

C. G. Carder, 2, Bone Hill, Buckingham, electrician.—Trustee, Mr. W. Whitehead, 58-61, York Terrace, Regent's Park, London, N.W.1, Official Receiver, released 17th October.

E. G. Phillips, electrical engineer, 39, Carrs Lane, Birmingham, 4.—Last day for receiving proofs for dividend 7th November. Trustee, Mr. R. F. Bendall, 126, Colmore Row, Birmingham, 3.

A. King, 6, Beresford Square, Woolwich, London, S.E.18, radio and electrical dealer.—Last day for receiving proofs for dividend 7th November. Trustee, Mr. W. J. W. Hill, 58-61, Tork Terrace, Regent's Park, London, N.W.1, Official Receiver.

D. Gillon, 52, Raynel Drive, Adel, Leeds, plumber and electrician.—Trustee, Mr. J. L. Williams, 3rd Floor, Pearl Chambers, East Parade, Leeds, 1, Official Receiver, released 22nd October.

Liquidation

Butterworth & Robinson, Ltd., electrical contractors, 20, Bold Street, Southport.—Winding up voluntarily. Liquidator, Mr. R. S. Irving, 413, Lord Street, Southport, appointed 23rd October.

Totally-Enclosed Spray Booth

When an extension to their Park Royal factory was considered, the Electroflo Meters Co., Ltd., asked Aerostyle, Ltd., to design a spray booth in which equipment of diverse shapes and sizes could be treated. The normal open front water wash booth was not suitable for all purposes and so a totally enclosed "custom-built" spraying shop was constructed mainly for large instrument panels and cubicles. The booth, 22ft long by 11ft 9in high, was developed. It was necessary to filter the incoming air and, because the operators were to be "sealed" inside, a safe, efficient exhaust system had to be incorporated. The prefabricated shop is built of galvanised sheeting with the induction of air through special metallic filters. Air outlets are arranged through four dry exhaust filters, each having a separate push-button starter so that should the total area not be required one or two fans only can be used. Stressed steel, rubber-sealed folding doors prevent the ingress of dusty air but the atmosphere within the spraying shop with doors closed is very comfortable.

For smaller pieces of equipment a 5ft open-fronted water wash booth was fitted to the outside of the spray paint shop with its own built-in exhaust ducted through the main exhaust system.

Totally-enclosed spray booth (right) with doors open. On the left is a 5ft water wash booth

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 6d each including postage) are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2

1954

13880. Standard Telephones & Cables, Ltd.—Saturable electromagnetic devices. 20th May, 1955. (803911.)

15203. English Electric Co., Ltd.—Electrical apparatus for producing an electric signal dependent on the tension in a continuous linear material. 24th May, 1955. (803811.)

24264. English Electric Co., Ltd.—Axle suspended electric traction motor drives. 19th August, 1955. (803883.)

26280. English Electric Co., Ltd.—Engine driven electric generating plant. 15th December, 1955. (803945.)

33336. British Telecommunications Research, Ltd.—Electrical signalling systems. 14th November, 1955. (804071.)

33549. Haden & Sons, Ltd., G. N.—Combined heating and lighting unit. 3rd November, 1955. (803968.)

35345. Automatic Telephone & Electric Co., Ltd.—Sequential selection or hunting arrangements. 28th October, 1955. (803996.)

1955

441. British Telecommunications Research, Ltd.—Electrical signalling systems. 30th December, 1955. (803881.)

6024. Igranic Electric Co., Ltd.—Electric switch units. 1st March, 1955. (804134.)

6499. Radio Corporation of America.—Semi-conductor devices and methods of making them. 4th March, 1955. (804000.)

7999. Wipac Development, Ltd.—Battery charging circuits. 7th March, 1956. (803946.)

11434. Philberth, B.—Stationary electromagnetic induction apparatus. 20th April, 1955. (803914.)

16371. British Telecommunications Research, Ltd.—Telephone systems. 22nd May, 1956. (804041.)

16799. General Electric Co., Ltd., Chick, F. S., Cornell, W., and Shepherd, S. A.—Methods of providing electrical terminals secured to a board or strip. 11th June, 1956. (804137.)

19884. Siemens Edison Swan, Ltd.—Mounting and electrical interconnection of electrical circuit components. 21st June, 1956. (803794.)

20564. Young, G. S.—Electric power supply system and method of controlling same. 15th July, 1955. (804101.)

21177. General Electric Co.—Lubricant for the surface of an insulated wire. 21st July, 1955. (804112.)

22149. Eitel-McCullough, Inc.—Klystrons. 2nd August, 1955. (803893.)

23221. Associated Electrical Industries, Ltd.—Arrangements for measuring current. 27th June, 1956. (803915.)

25425. Burke, J. D.—Radio receivers. 28th June, 1956. (Cognate applications 25426, 5th September, 1955, and 27781, 29th September, 1955.) (803822.)

31637. Stephan, S. (trading as Stephan und Sohne, A.).—Magnetic band-brake especially for electric motors. 4th November, 1955. (803824.)

33877. Siemens Edison Swan, Ltd.—Telephone and like signalling systems. 20th November, 1956. (803973.)

35334. Automatic Telephone & Electric Co., Ltd.—Traffic control systems. 3rd December, 1956. (803916.)

35435. Welwyn Electrical Laboratories, Ltd., and Dearden, J.—Electrical resistors. 10th December, 1956. (803885.)

36972. General Electric Co., Ltd., Carnell, J. C., Shepherd, S. A., and Taylor, F.—Electrical plug connectors. 20th December, 1956. (803951.)

37105. Western Electric Co., Inc.—Methods and apparatus for the electrolytic shaping of electrically conductive bodies. 28th December, 1955. (803887.)

1956

66. Eitel-McCullough, Inc.—Beam type electron tube. 2nd January, 1956. (803825.)

192. Collins Radio Co.—Modulator and/or mixer circuits. 3rd January, 1956. (803888.)

472. Dow Chemical Co.—Cathodic protection anode assembly. 5th January, 1956. (803863.) 1295. Sacrificial anodes for use in cathodic protection systems. 13th January, 1956. (803864.)

1339. Automatic Telephone & Electric Co., Ltd.—Mounting arrangements for electrical components. 24th December, 1956. (803826.)

3235. General Electric Co., Ltd.—Refrigerator condensers. 29th January, 1957. (803917.)

3889. Cole, Ltd., E. K., and Pichal, H. T.—Television receivers. 7th February, 1957. (803976.)

5023. Metropolitan-Vickers Electrical Co., Ltd.—Steam turbine power plant. 7th February, 1957. (803829.)

5443. Electric & Musical Industries, Ltd.—Circuit arrangements for controlling a plurality of electron beams. 22nd February, 1957. (804102.)

6705. Hughes Aircraft Co.—Semiconductor transistor device. 2nd March, 1956. (804011.)

7067. Kokusai Denshin Denwa Co., Ltd.—Electrical circuits. 6th March, 1956. (803802.)

8305. Standard Telephones & Cables, Ltd.—Semiconductor comprising silicon and method of making it. 16th March, 1956. (803830.)

8393. Skogsberg, E. L.—Party-line telephone system. 16th March, 1956. (803977.)

9396. Kokusai Denshin Denwa Co., Ltd.—Amplifiers. 26th March, 1956. (804012.)

9939. Standard Telephones & Cables, Ltd.—Automatic tuning system. 29th March, 1956. (804103.)

12820. Chloride Electrical Storage Co., Ltd.—Alkaline accumulators. 31st January, 1957. (803954.)

12953. Chamberlain & Hookham, Ltd., Deacon, L. O., and Purkis, J.—Maximum electric demand indicating apparatus. 26th March, 1957. (803833.)

16634. Allis-Chalmers Manufacturing Co.—Gas-blast circuit-breaker. 29th May, 1956. (804078.)

17350. Philips Electrical Industries, Ltd.—Electroscopes for radiation deflection. 13th June, 1957. (804015.)

18476. Telefonaktiebolaget L. M. Ericsson.—Lightning arrestors comprising a gas discharge tube. 14th June, 1956. (803890.)

18763. Companhia Portuguesa Radio Marconi.—Electric multi-channel pulse communication systems. 18th June, 1956. (803804.)

22741. Kanthal, A. B.—Production of electric resistance heaters. 23rd July, 1956. (803878.)

25105. Southern United Telephone Cables, Ltd.—Method and apparatus for stripping the covering from an electric conductor. 15th August, 1957. (803899.)

26915. Broniewski, B.—Control systems for synchronous machines. 3rd September, 1956. (803957.)

28169. Montecatini Soc. Generale per l'Industria e Chimica.—Electronic valve holders. 14th September, 1956. (803958.)

30778. Collins Radio Co.—Photoelectric switching device for mechanical squelch. 9th October, 1956. (803902.)

30970. Babcock & Wilcox, Ltd.—Tubulous vapour generating and vapour heating units. 11th October, 1956. (803903.)

34338. Brown, Boveri & Cie A.G.—Arrangement for driving a winding device by means of a d.c. motor. 9th November, 1956. (803962.)

36629. Eaton Manufacturing Co.—Control apparatus for electrical couplings. 30th November, 1956. (804020.)

38404. General Electric Co.—Electric heating and temperature sensitive control wire. 17th December, 1956. (804086.)

1957

1032. Siemens-Schuckertwerke A.G.—Connecting means for connecting fittings in gas-tight manner to the sheathing of gas-filled electrical cables. 10th January, 1957. (804128.)

2857. Soc. d'Electro-Chimie, d'Electro-Metallurgie et des Acieries Electriques d'Ugine.—Electrolytic production of iron powder. 25th January, 1957. (803844.)

4239. Sperry Gyroscope Co., Ltd.—Simulation of condensers in low frequency or d.c. circuits. 7th February, 1957. (803935.)

9902. Union Carbide Corporation.—Multi-arc welding. 26th March, 1957. (803846.)

12929. Philips Electrical Industries, Ltd.—Magnet systems. 23rd April, 1957. (803986.)

16969. Stackpole Carbon Co.—Dynamo-electric brush. 28th May, 1957. (803988.)

1958

3311. British Telecommunications Research, Ltd.—Telephone systems. 22nd May, 1956. (Divided out of 804041.) (804042.)

Brazilian Power Loan

A loan of £26 million has been granted to Brazil to enable the construction of the first stage of a large hydro-electric scheme to be carried out. The development is at the Furnas Rapids on the Rio Grande about 200 miles north of Sao Paulo.

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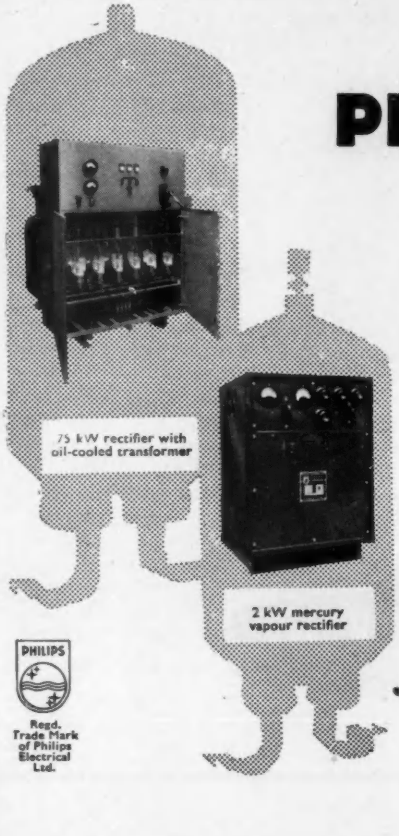

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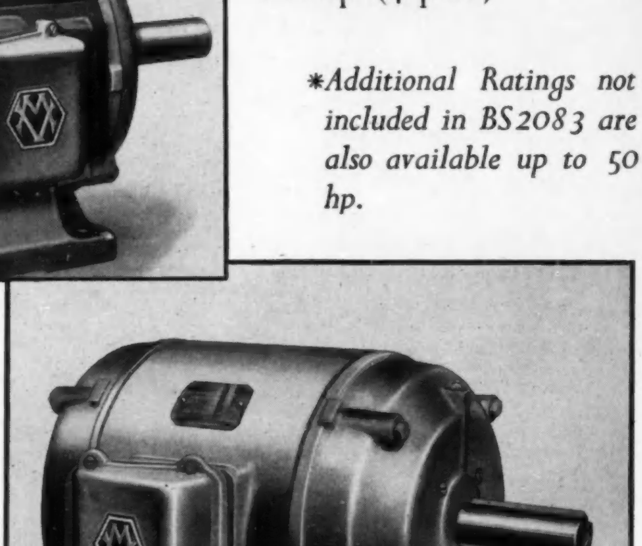

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NEXT WEEK'S EVENTS

Organisers of electrical functions are advised to make use of the “Electrical Review” clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged.

Monday, 10th November

Birmingham.—College of Technology, 6 p.m. I.E.E. South Midland Supply and Utilisation Group. “Design and Application of Large Solid-Rotor Asynchronous Generators,” by P. Richardson.

Bournemouth.—Grand Hotel, Firvale Road, 8 p.m. A.S.E.E. Bournemouth Branch. “The Industrial Uses of Magnetic Power,” by T. G. Hawker.

Cardiff.—At the South Wales Institute of Engineers, Park Place, 6 p.m. I.E.E. Western Centre. “Supply-Voltage and Current Variations Produced by a 60-ton 3-phase Electric Arc Furnace,” by Dr. B. C. Robinson and A. I. Winder.

London.—Savoy Place, 5.30 p.m. Institution of Electrical Engineers. Informal meeting. Discussion on “How Safe are Domestic Electrical Appliances?” opened by H. G. F. Gamble.

White Hall Hotel, Bloomsbury Square, W.C.1, 7.15 p.m. A.S.E.E. Central London Branch. “Marine Electrical Installation,” by G. Hutchinson.

Newcastle-upon-Tyne.—Neville Hall, Westgate Road, 6.15 p.m. I.E.E. North Eastern Centre. “Investigations of Power-Follow Current Phenomena using a Synthetic Power Source,” by Dr. L. L. Alston and Professor F. M. Bruce; and “The Impulse Initiation of Arc Discharges,” by Dr. L. L. Alston.

Sheffield.—Grand Hotel, 6.30 p.m. I.E.S. Sheffield Centre. Presidential address, by C. C. Smith.

Wembley Park.—Century Hotel, Forty Avenue, 8.15 p.m. A.S.E.E. North West London Branch. “The Approved Contractor and the National Inspection Council,” by E. J. Sutton.

Monday, 10th November, to Friday, 14th November

Glasgow.—Kelvin Hall. Electro-Heat and Productivity Conference and Exhibition, organised by the South of Scotland Electricity Board.

Monday, 10th November, to Saturday, 15th November

London.—Olympia. Public Works and Municipal Services Congress and Exhibition.

Tuesday, 11th November

Barnsley.—Queen's Hotel, 7 p.m. E.P.E.A. Sheffield Local Technical Group. “Lighting for Display,” by J. W. Bessant.

Belfast.—Queen's University, 6.30 p.m. I.E.E Northern Ireland Centre. “Digging up the Past,” by C. Snowdon.

Bradford.—Y.E.B., Sunbridge Road, 7 p.m. I.E.E. North Midland Graduate and Student Section. “Developments in Lighting,” by Dr. F. A. Benson.

Cardiff.—Angel Hotel, 7.30 p.m. A.S.E.E. South Wales Branch. Open meeting and film of 1958 Electrical Engineers' Exhibition, presented by P. A. Thorogood.

Eltham.—Eltham Green School, Queenscroft Road, S.E.9, 7.45 p.m. A.S.E.E. South East London Branch. “Stage Illumination,” by F. E. Brown.

Glasgow.—39, Elmbank Crescent, 7 p.m. I.E.E. South East Scotland Centre. “The Recognition of Moving Vehicles by Electronic Means,” by T. S. Pick and A. Readman.

39, Elmbank Crescent, 8 p.m. A.S.E.E. Glasgow Branch. “Electric Pumps for Marine Uses,” by J. E. Bean.

London.—Connaught Rooms, 12.30 for 1 p.m. Electrical Industries Club. Luncheon. Speaker, C. T. Melling.

Café Royal, 7.30 p.m. I.E.E. Measurement and Control Section. Dinner.

At the Federation of British Industries, 21, Tothill Street, S.W.1, 6 p.m. I.E.S. London meeting. “Some Practical Considerations in the Design and Manufacture of Neon Signs,” by A. Urquhart.

Manchester.—Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North-Western Utilisation Group. Discussion on “To What Extent is Motor Protection Worth While?” opened by E. H. Nicholson and J. C. Jones.

Engineers' Club, Albert Square, 7.15 p.m. Incorporated Plant Engineers, Manchester Branch. “Radio-isotopes in Industry,” by W. G. Busbridge.

Portsmouth.—Ministry of Labour and National Service, Lake Road, 7.30 p.m. A.S.E.E. Portsmouth and District Branch. “National Inspection Council for Electrical Installation Contracting,” by T. Howell.

Rugby.—Rugby College of Technology and Arts, 6.30 p.m. I.E.E. Rugby Sub-Centre. “A New Cathode-Ray Tube for Monochrome and Colour Television,” by Dr. Ing D. Gabor, Dr. P. R. Stuart and P. G. Kalman.

York.—Georgian House, Blossom Street, 7.30 p.m. A.S.E.E. York Branch. “Transistors.”

Tuesday, 11th November and Wednesday, 12th November

London.—Connaught Rooms, W.C.2. British Electrical and Allied Manufacturers' Association. Publicity Conference.

Wednesday, 12th November

Birmingham.—James Watt Memorial Institute, 6.30 p.m. I.E.E. South Midland Graduate and Student Section. “Impulse Overvoltage Protection of Electrical Systems,” by J. M. Chakraborty.

Bradford.—Midland Hotel, 7.30 p.m. A.S.E.E. Bradford Branch. “Motor Control Centres for Modern Industry,” by C. Robinson.

Dundee.—Taypark Hotel, West Ferry, 7.30 p.m. Incorporated Plant Engineers, Dundee Branch. “Industrial Refrigeration,” by R. Campbell.

Hanley.—Grand Hotel, 7.45 p.m. I.E.E. North Staffordshire Graduate and Student Section. Senior chairman's address, “Electrical Engineers and Electronics,” by R. W. Palmer.

Lancaster.—North Western Electricity Board Demonstration Theatre, North Road, 7.15 p.m. I.E.E. North Lancashire Sub-Centre. “Recent Developments in Medium-Voltage High-Breaking-Capacity Fuse Links,” by R. H. Dean.

Leeds.—St. Mark's House, 186, Woodhouse Lane. Plastics Institute, Yorkshire Section. “Printed Circuits on Plastics Panels,” by F. Hicks-Arnold.

London.—At the Institution of Electrical Engineers, Savoy Place, W.C.2, 2 p.m. Electrical Association for Women. Caroline Haslett Trust Lecture, by Marjorie Pickford.

May Fair Hotel, 7 for 7.30 p.m. Telecommunication Engineering and Manufacturing Association. Annual dinner.

Luton.—Chamber of Commerce, George Street West, 8 p.m. A.S.E.E. Luton Branch. “Quiz on I.E.E. Regulations,” by E. J. Sutton.

Manchester.—Engineers' Club, Albert Square, 6.45 p.m. I.E.E. North-Western Radio and Telecommunication Group. “The Relation between Picture Size, Viewing Distance and Picture Quality, with special reference to Colour Television and to Spot-Wobble Techniques,” by L. C. Jesty.

Café Royal, Peter Street, 6.30 p.m. I.E.S. Manchester Centre. Annual dinner.

Oxford.—Southern Electricity Board, 37, George Street, 7 p.m. I.E.E. District meeting. “Development of the Super Grid System and its Control,” by W. Casson.

Portsmouth.—C.E.G.B., 111, High Street, 6.30 p.m. I.E.E. Southern Centre. “A Survey of Harbour Approach Aids,” by A. L. P. Milwright.

Worcester.—Victoria Technical Institute, 7.30 p.m. I.E.E. South Midland Centre. “The Influence of Maintenance Requirements on the Design of Industrial Electrical Equipment,” by H. C. Fox and J. H. Harris.

Thursday, 13th November

Barrow.—North Western Electricity Board, Duke Street, 7.15 p.m. I.E.E. North Lancashire Sub-Centre. “Recent Developments in Medium-Voltage High-Breaking-Capacity Fuse Links,” by R. H. Dean.

Bournemouth.—Grand Hotel, 6.30 p.m. I.E.E. Southern Graduate and Student Section. “A Best Paper.”

Bristol.—The University, 7 p.m. I.E.E. Bristol Graduate and Student Section. “A High Speed Electronic Revolution Counter,” by R. R. Read.

Dundee.—Queen's College, 7 p.m. I.E.E. North Scotland Sub-Centre. “Results of Full-Scale Stability Tests on the British 132 kV Grid System,” by Dr. F. Busemann and W. Casson.

Glasgow.—425/427, Sauchiehall Street, 7.15 p.m. Incorporated Plant Engineers, Glasgow Branch. “Packaged Oil Fired Boilers,” by A. Wilson.

London.—Savoy Place, 5.30 p.m. I.E.E. Utilisation Section (in conjunction with the British Nuclear Energy Conference). “Electrification of the U.K.A.E.A. Industrial Group Factories,” by J. W. Binns and W. J. Outram.

Connaught Rooms, Great Queen Street, W.C.2, 6.45 for 7.15 p.m. Public Transport Association. Annual dinner.

Newcastle-upon-Tyne.—Roadway House, Oxford Street, 7 p.m. Incorporated Plant Engineers, North East Branch. “The Gas Turbine,” by H. R. Beaton.

Swansea.—South Wales Electricity Board, The Kingsway, 6 p.m. I.E.E. West Wales (Swansea) Sub-Centre. “Earthing of Low and Medium Voltage Distribution Systems and Equipment,” by F. Mather.

Wimbledon.—Prince of Wales Hotel, 7.45 p.m. A.S.E.E. South West London Branch. Branch Lecturette Competition: “Thermo-Electric Cables,” by D. Redman, and “Air-Cooled Transformers,” by C. Penny.

Friday, 14th November

Aberdeen.—Robert Gordon's Technical College, 7.30 p.m. I.E.E. North Scotland Sub-Centre. “Results of Full-Scale Stability Tests on the British 132 kV Grid System,” by Dr. F. Busemann and W. Casson.

Birmingham.—Regent House, St. Philip's Place, Colmore Row, 7 p.m. Society of Instrument Technology, Midland Section. “Transistors,” by S. S. Goldberg.

Cardiff.—St. Mellons County Club. Plastics Institute, South Wales and Monmouthshire Section. Annual dinner.

Clacton-on-Sea.—Royal Hotel. Ipswich and District Electrical Association. Ladies' night.

Leeds.—Queen's Hotel, 7 for 7.30 p.m. I.E.E. North Midland Centre. Annual dinner.

London.—Grosvenor House, Park Lane, W, 7 p.m.-2 a.m. Electrical Industries Benevolent Association. Annual ball.

Connaught Rooms, 12 noon. National Inspection Council for Electrical Installation Contracting. Annual general meeting and luncheon.

21, Albemarle Street, W.1, 9 p.m. Royal Institution of Great Britain. “Colour Television: Progress During the Last Decade,” by G. G. Gouriet.

Portsmouth.—College of Technology, 7 p.m. Institution of Electronics, Southern Division. “The Applications of Computers,” by R. S. Evans.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where " Contracts Open " are advertised in our " Official Notices " section the date of the issue is given in parentheses

Australia.—Brisbane Electricity Department. 28th November. Street lighting lanterns and suspension clamps. (E.S.B. 26487/58. Ten/35487.)*

Postmaster-General's Department, Melbourne. 18th December. Instrument and switchboard cords. (E.S.B. 25830/58. Ten/35486.)*

Belfast.—Northern Ireland Council for Orthopædic Development. 18th November. Electrical installation in special school, " Marmont," Holywood Road. J. McCandless, consulting engineer, 6, Murray Street, Belfast.

Fareham.—U.D.C. 21st November. Trunk road lighting equipment. (See this issue.)

Formosa.—Central Trust of China, Taipei. 22nd November. Electrical equipment, signal and alarm apparatus and electrical welding equipment. (E.S.B. 26126/58/I.C.A. Ten/35437.)*

Iran.—Iranian State Railways, Teheran. 19th November. Copper wire and disconnecting switches. (E.S.B. 26612/58. Ten/35491.)*

Jordan.—Jordan Cement Factories Co., Amman. 15th January. Two 850-900 kW diesel generator sets. (E.S.B. 26529/58. Ten/35495.)*

Kettering.—Corporation. 28th November. Trunk road lighting equipment. (See this issue.)

Londonderry.—R.D.C. 18th November. Electrical installations in 147 proposed new dwellings in connection with Lissahawley development scheme. W. & M. Given, 3, Richmond Street, Londonderry.

New Zealand.—Tender Committee, New Zealand Electricity Department, Wellington. 18th November. 11 kV switchgear. (E.S.B. 26408/58. Ten/35424.)*

G.P.O., Wellington. 1st December. Power relays. (E.S.B. 26407/58. Ten/35411.)*

South Africa.—Stores Department, South African Railways, Johannesburg. 21st November. Regenerative braking equipment for 3,000 V d.c. railway electrification. (E.S.B. 26514/58. Ten/35462.)* 26th November. Cable. (E.S.B. 26394/58. Ten/35405.)* Transformers ranging from 5 kVA to 50 kVA. (E.S.B. 26395/58. Ten/35403.)*

Sudan.—Ministry of Works, Stores Section, Khartoum. 19th November. Electric lamp globes. (E.S.B. 26880/58. Ten/35574.)*

Ministry of Communications Department, Posts and Telegraphs, Khartoum. 15th December. Automatic telephones. (E.S.B. 26396/58. Ten/35488.)*

ORDERS PLACED

Boldon (Durham).—U.D.C. Additional street lamps at Whitburn (£1,060).—B. L. Oliver.

South Shields.—Corporation. Two control switchboards for South Shields Marine and Technical College (£1,065).—Artic Fuse & Electrical Manufacturing Co.

Trowbridge.—U.D.C. Electrical installation work at the Market Chambers (£578).—Argyle Electrical Installations.

Tynemouth.—Town Council. Electrical installations in new fire station and ambulance depot (£4,093) and blocks of flats (£4,132).—F. Gray. Internal telephone system at ambulance depot and fire station (£998).—Modern Telephones (Great Britain).

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Aldershot.—Houses (300), Heron Wood scheme; borough surveyor, Municipal Buildings.

Barnstaple.—Secondary school for girls (£157,000); Devon county architect, 97, Heavitree Road, Exeter.

Bath.—Factory and offices, Lower Bristol Road; John Hygate, Ltd., Monmouth Place.

Berwick.—Factory for Jus-Rol, Ltd., Coldstream; Scottish Construction Co., Ltd., contractors, Edinburgh.

Billingham-on-Tees. — Proposed cinema (£115,000); E. Shaw, U.D.C. surveyor.

Birchington (Kent).—Shops and flats in Sandles Road; Debenham, Tewson & Chinnocks, surveyors, St. Stephens Chambers, Telegraph Street, London, E.C.2.

Birmingham.—Shops (29) and flats (36), Shard End estate; Geo. Stubbings, Ltd., builders, 201, Streetley Road, Erdington.

Brighton.—Flats (187), Albion Hill redevelopment scheme and 16 old persons' flats, Warmdene Road; planning officer, 26/30, King's Road.

Canterbury.—First section of scheme for civic centre; city architect, Dane John.

Carlisle.—Houses (60), Morton estate; J. Twiname, Ltd., builders, Brigham, Cockermouth.

Darlington.—Houses (33), Middleton St. George, for R.D.C.; Blackett & Son, builders, 63, Bondgate.

Daventry.—Additional 100 houses for employees of British Timken; borough surveyor.

Dewsbury.—Houses (47), Eastborough redevelopment scheme; buildings surveyor, Town Hall.

Durham.—New offices for the National Health Service (£50,000); Bell & Ridley, Ltd., builders, North Road, Durham.

Gloucester.—Additions to Council offices, Brunswick Square (£59,000); W. J. Knight, clerk, Berkeley Chambers.

Harwich.—Maternity wing for District Hospital; North East Metropolitan Regional Hospital Board, 3/4, Queen Anne Street, London, W.1.

Hendon.—Hampstead Garden Suburb Junior School, Childs Way, N.W.11; R. H. Williams, town clerk, Town Hall, Hendon, N.W.4.

High Wycombe.—Old people's home, Cressex Road; Bucks C.C. architect, County Offices, Aylesbury.

Huddersfield.—Civic centre proposed on site in Ramsden Street; borough architect, High Street Buildings.

Hull.—Houses (107), Kirklands Road, Lomond Road and Rosedale Grove; A. Rankine, city architect, Guildhall.

Houses (78), Auckland Avenue; S. Spruit, Ltd., builders, 174, Telford Street.

Ilford.—Shops, showrooms and offices, High Road; Town & City Properties, Ltd., Ormonde House, St. James's Street, London, S.W.1.

Isle of Wight.—New fire station at East Cowes; county architect, County Hall, Newport.

Jarrow.—Shopping centre (25 shops), Charles Street area; H. W. T. Perkins, borough engineer.

Kesteven.—Building projects for school meals service (£75,000); county architect, Sleaford, Lincs.

Kidderminster.—Administrative buildings and restaurant in connection with scheme for new market; J. G. Stewart, borough engineer, 110, Mill Street.

London.—Factory, Merton, for Hancock, Corfield & Waller, Ltd.; Ides, Ltd., builders, Richmond Road, Kingston-on-Thames.

Macclesfield.—Factory, Hurdsfield estate; Cableform, Ltd., Romiley, Cheshire.

Middlesbrough.—Ice cream factory, Jefferson Street, for G. Crolla; T. A. Crawford, architect, 80, Borough Road.

Morecambe.—Methodist church, Bare site; A. Robinson & Sons, Ltd., builders, Westfield Works.

Newcastle-on-Tyne.—Thirty old people's houses, Montagu estate; W. N. Howe, Ltd., builders, Heaton Road.

Norwich.—Works and offices; Roneo, Ltd., Roneo Works, Romford.

Nottingham.—Fire station, Abbey Street; city engineer.

Oldbury.—(a) Dwellings (33), and (b) dwellings (77), Lion Farm estate; borough engineer, Municipal Bank Chambers, Birmingham Street.

Oldham.—Houses and bungalows (94), Fitton Hill estate extension; Cameron & Middleton, quantity surveyors, 21, Queen Street, Oldham.

Oxford.—Houses (71), Blackbird Leys estate; C. Bryant & Son, Ltd., builders, 65, Whitmore Road, Edgbaston, Birmingham.

Plymouth.—Eighteen shops and 24 flats, Frankfort Gate; John Laing & Son, Ltd., builders, Bunns Lane, N.W.7.

Portsmouth.—Showrooms and offices, Fratton Road and Arundel Road; Glanfield Lawrence, Ltd., 407/13, High Road, London, N.12.

Redditch.—Factory, Arthur Street; Payne & Holloway, Ltd., 25, Johnstone Street, Birmingham, 16.

Rotherham.—Police traffic headquarters (£31,475) and weights and measures offices (£29,806); E. J. Manson, borough surveyor, Municipal Offices.

Sandwich.—Houses (49); borough surveyor, Municipal Offices.

Southend-on-Sea.—Showrooms and offices, Hippodrome Theatre site; Associated Suburban Properties, Ltd., 38, Upper Grosvenor Street, London, W.1.

South Nutfield.—Housing estate; True Bond Homes, Ltd., 342, London Road, Twickenham.

Stansted. — County secondary school (£100,000); Gerard Lacoste, architect, 247, Regent Street, London, W.1.

Stockton-on-Tees.—Showrooms for Metropole Motors, Ltd.; R. F. Bluck, architect, 147, Bath Street, Glasgow, C.2.

Three-storey extensions, Bridge Road, for Isaac Robson & Co.; T. A. Crawford, architect, 80, Borough Road, Middlesbrough.

Wigton.—Bus station, King Street; Cumberland Motor Services, Ltd., Tangier Street, Whitehaven.

Worcester.—Erection of Warndon Primary School; Harry B. Gorst, architect, 97, High Street.

*** Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).**

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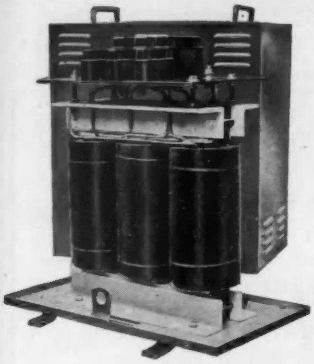

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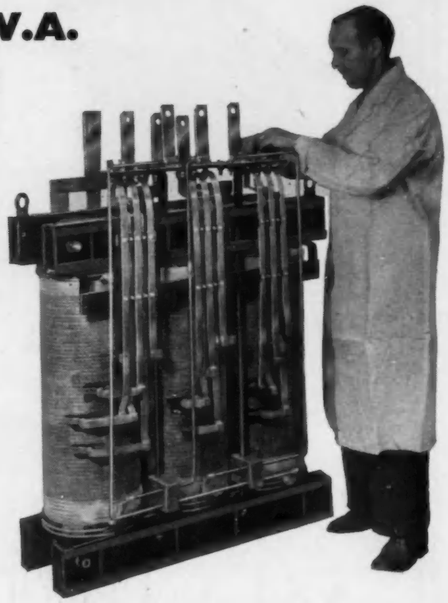

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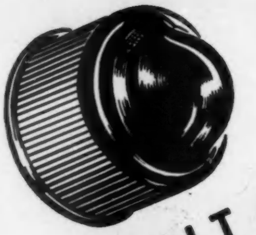

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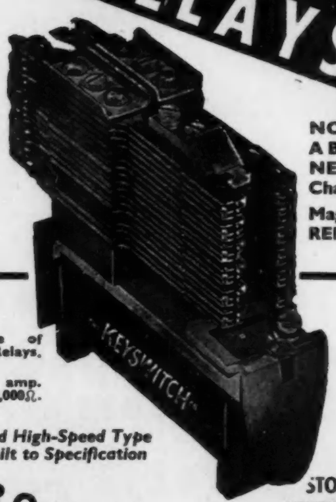

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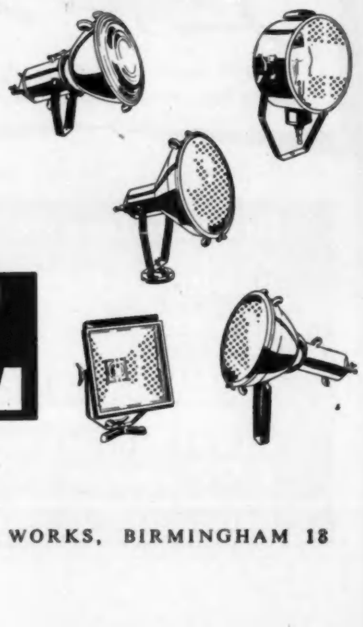

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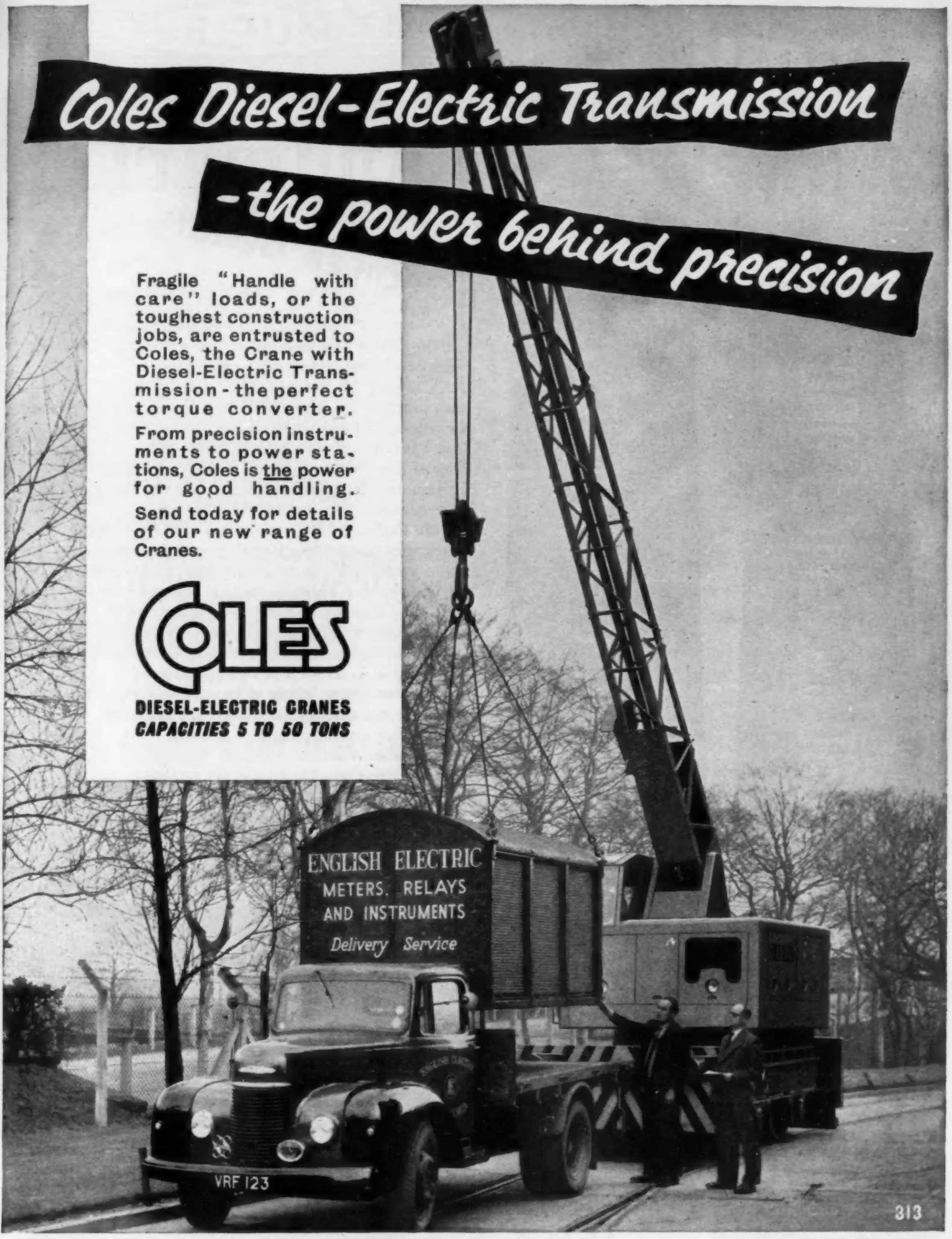

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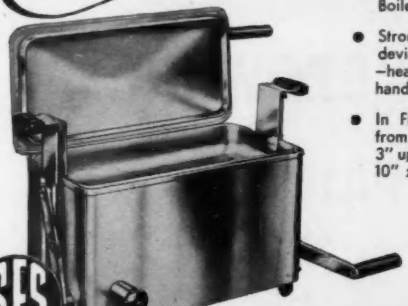

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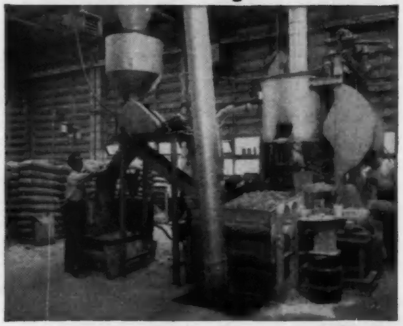

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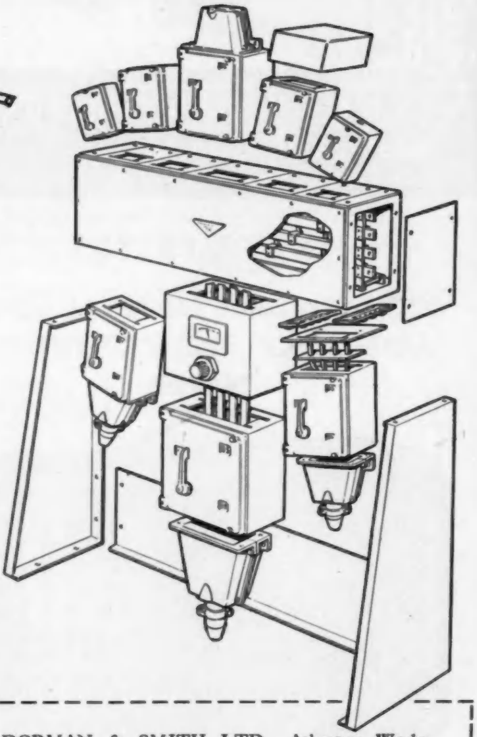

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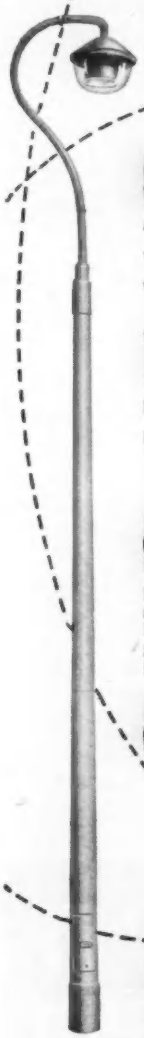

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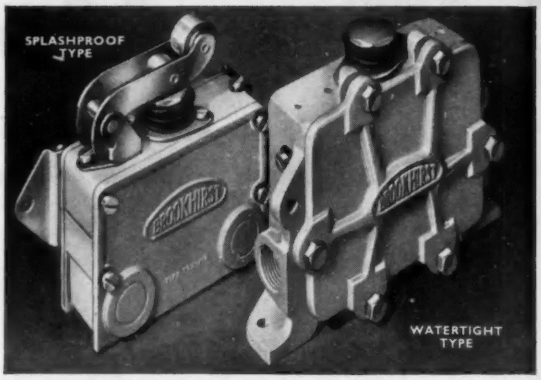

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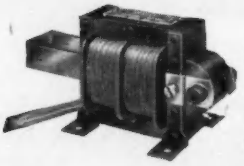

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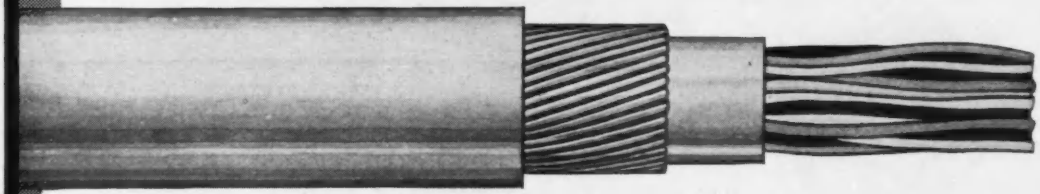

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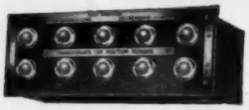

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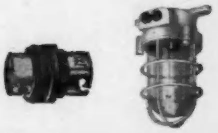

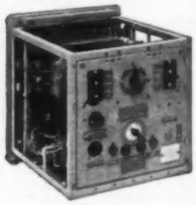

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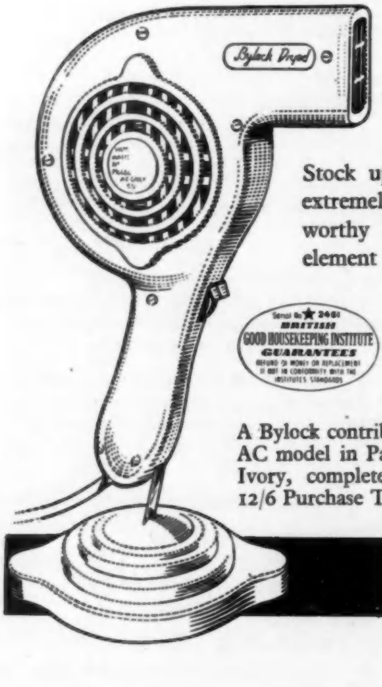

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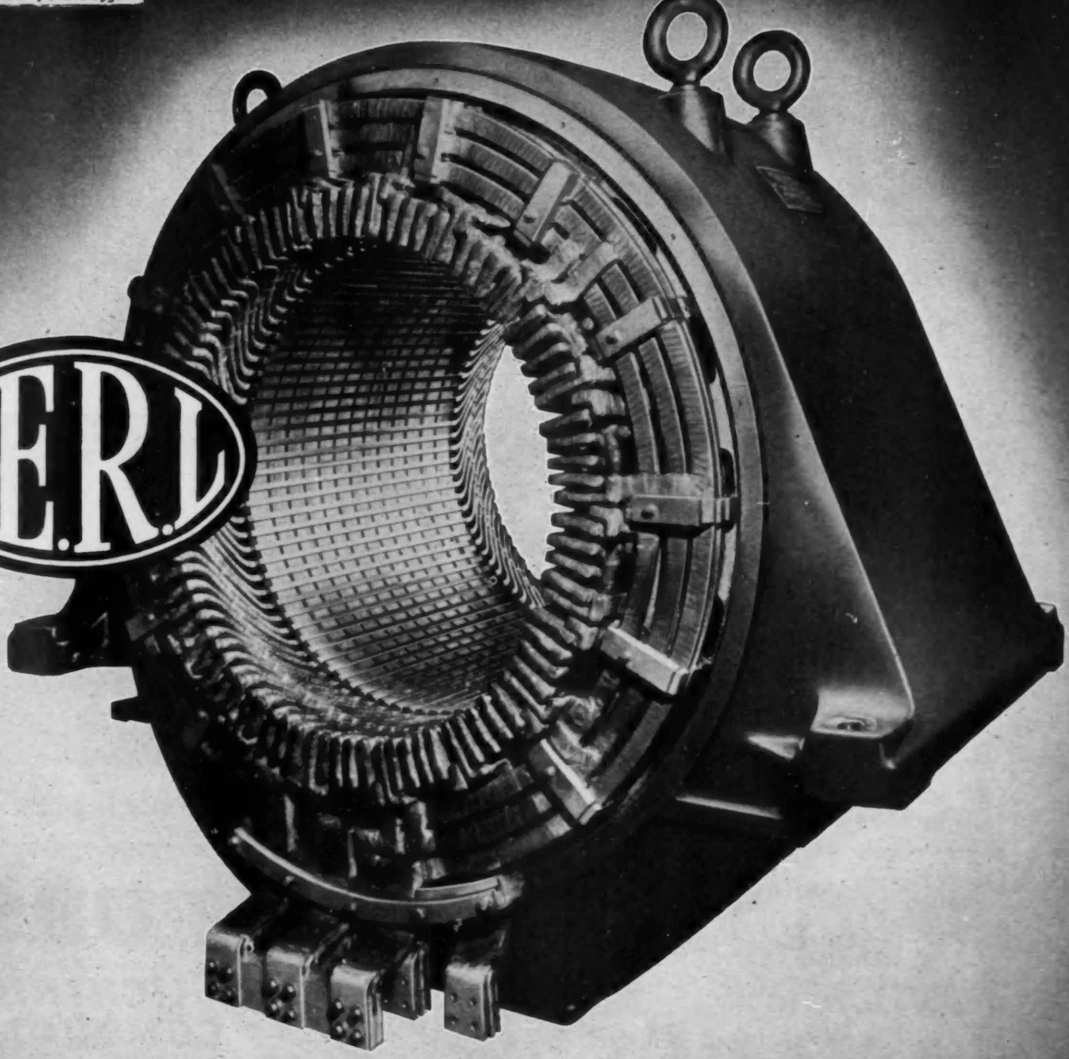

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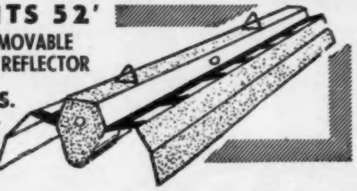

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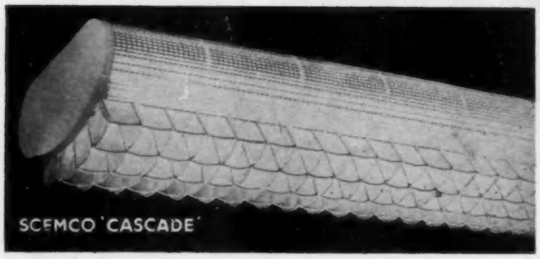
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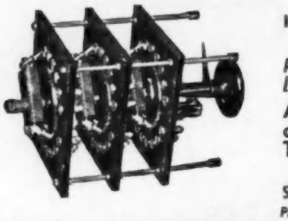

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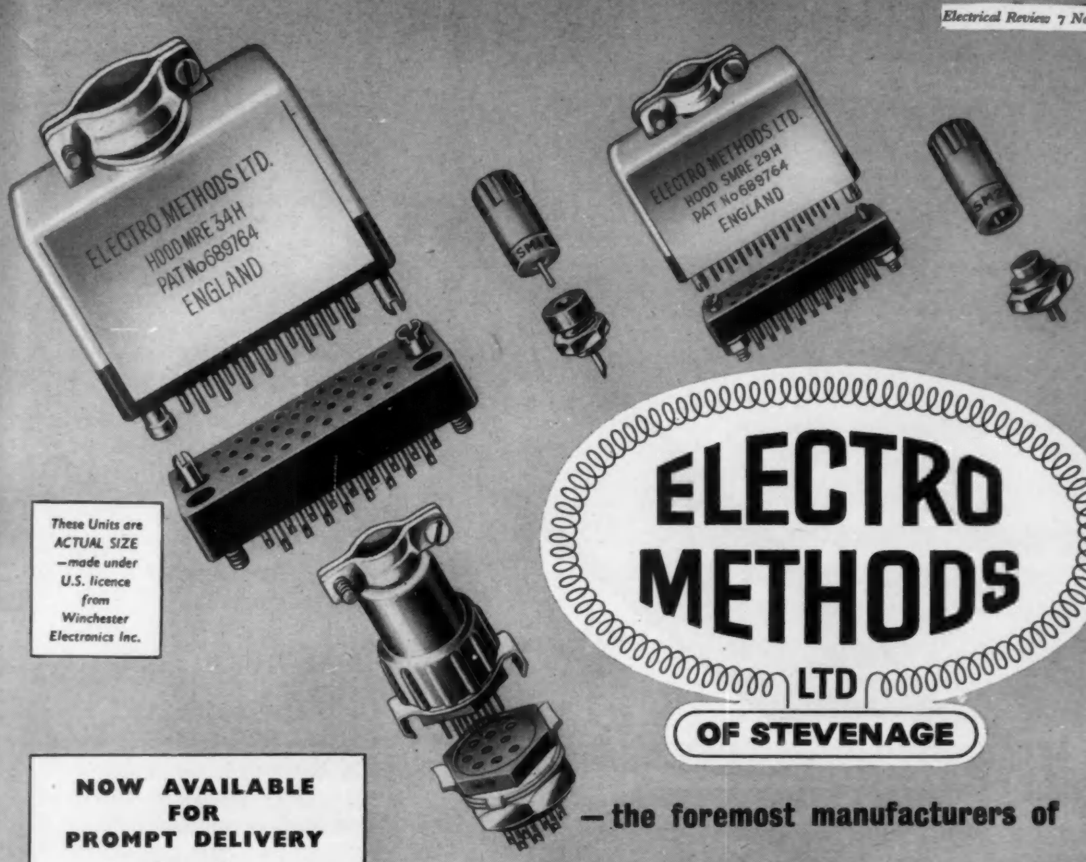

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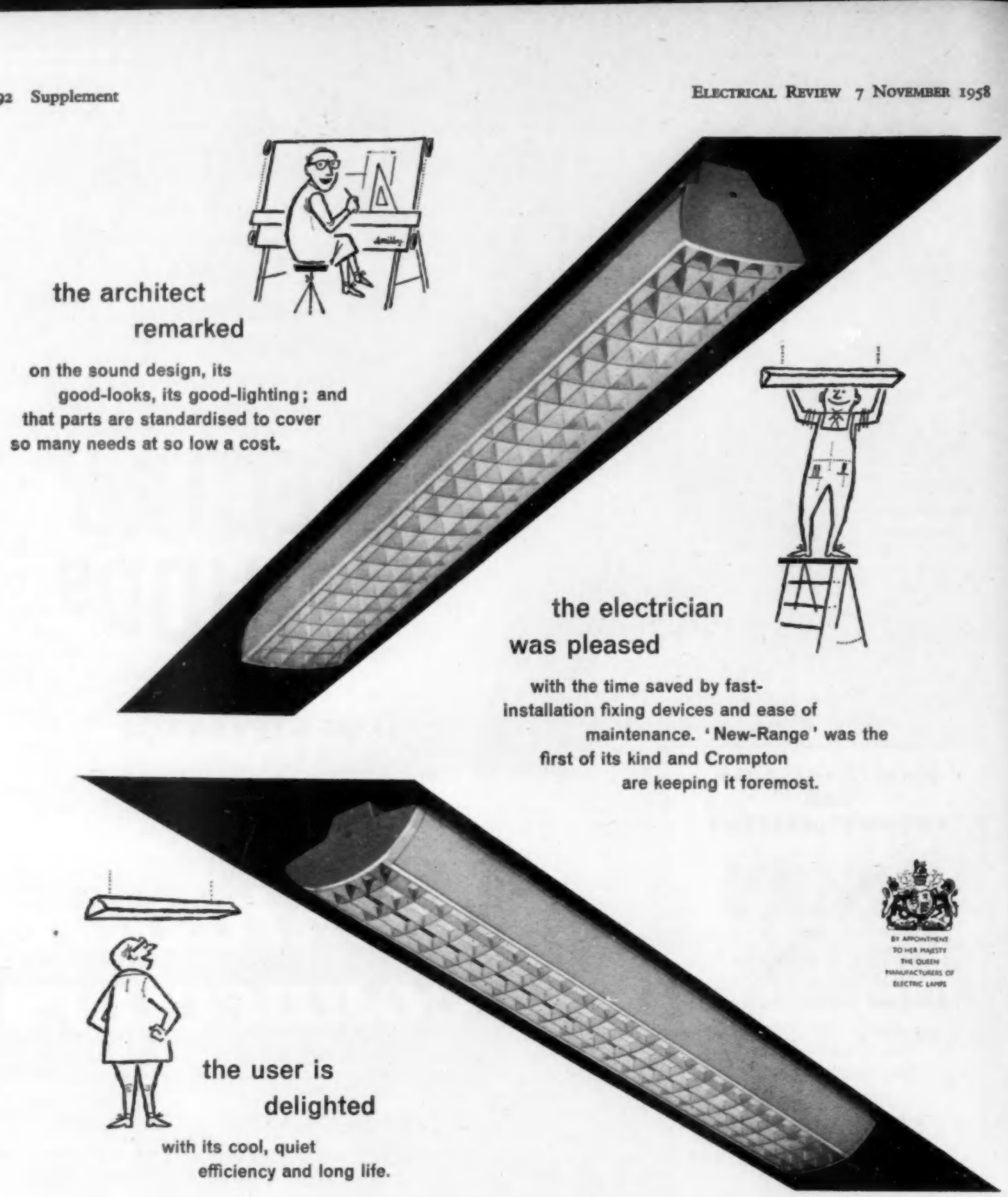

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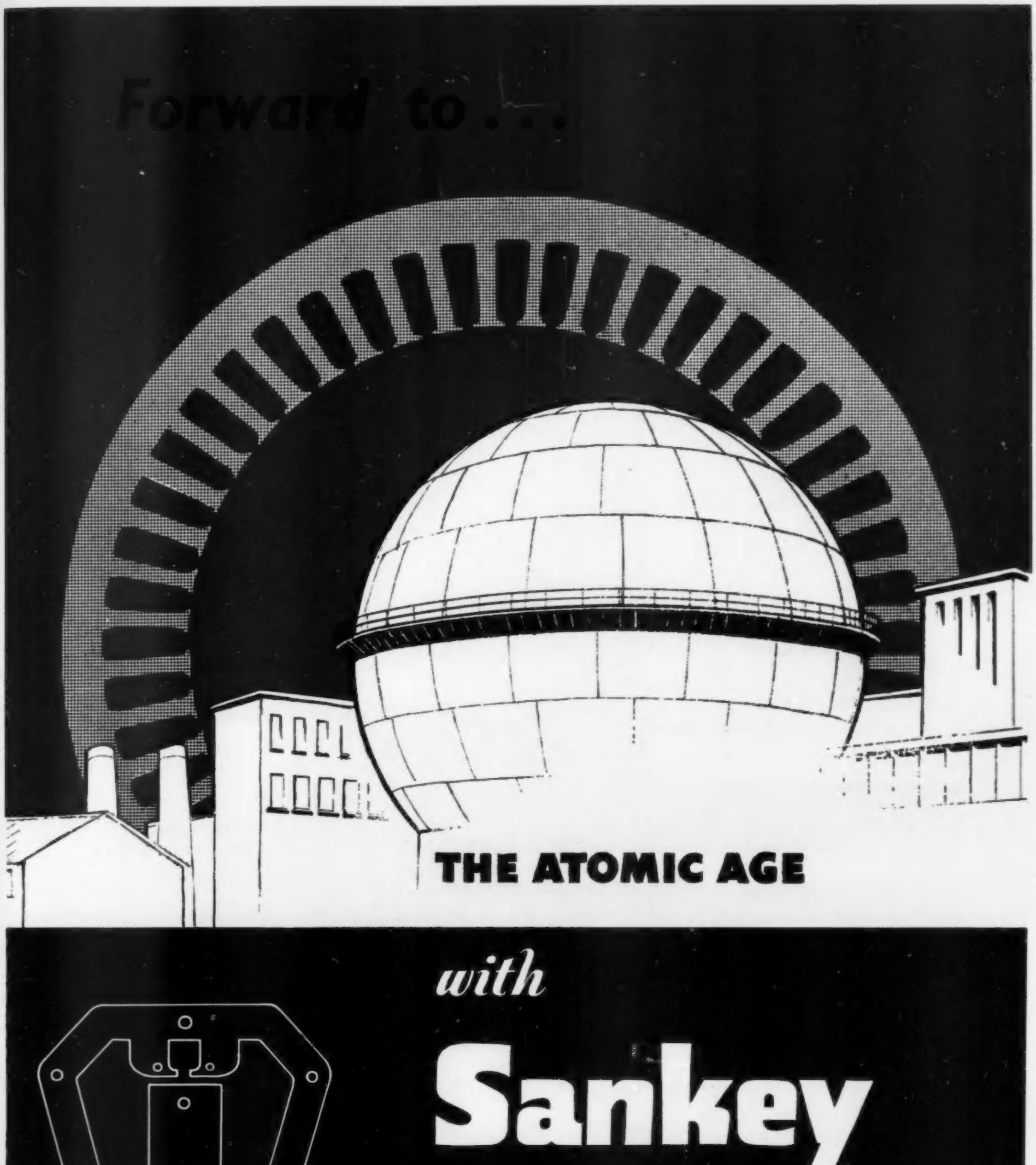

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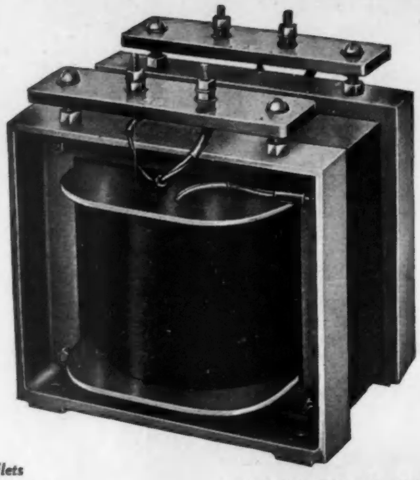

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The
TRANSFORMER & ELECTRICAL CO. LTD.
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METWAY
"FLEXWAY"

Manufactured in
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Also available
RIGID
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BLOCKS

"EXAKTWAY"
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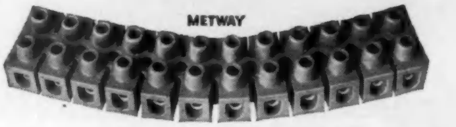


"POLYWAY" and "RUBBERWAY"
Write for Brochure NBQ/10/ER

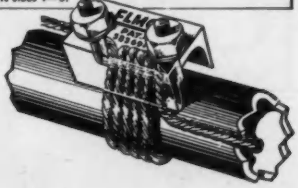
METWAY WORKS • KEMPTOWN • BRIGHTON

"ELMO"

EARTHING CLAMPS
A COMPLETE RANGE TO B.S.951. 1948
IN 4 SIZES

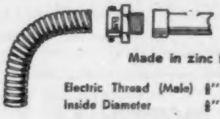
	A123	B45	C67	D8910
for earthing cables up to	7/0.036"	7/0.064"	19/0.064"	19/0.083"
to fit B.S. conduit sizes	1, 2 & 3	4 & 5	6 & 7	8, 9 & 10
i.e. in trade terms	½" to ¾"	1" and 1¼"	1½" and 2"	2½" to 3½"

NOTE ALSO: Type A123 is suitable for Earthing Cables up to 7/0.029" and for B.S. conduit sizes 1—5.



"Elmo" Earthing Clamps are of robust construction. Impossible for wire to pull out, always under tension, therefore a most satisfactory earth and a permanent safeguard.

ELECTRICAL FITTINGS



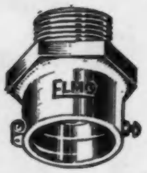
Flexible-to-rigid
CONDUIT COUPLINGS
Made in zinc base alloy in the following sizes

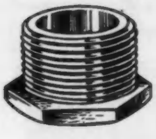
Electric Thread (Male)	⅝"	¾"	1"	1¼"	1½"	2"
Inside Diameter	⅝"	¾"	1"	1¼"	1½"	2"

Electric Thread (Male)	½"	¾"	1"	1¼"
Inside Diameter Flexible Conduit	½"	⅝"	¾"	1"

WITH EARTHING TERMINAL

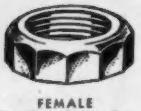
Special Features: Integral Earthing Terminal, tinned ready for soldering. Fixing screw for continuity. Internal threads suit all makes of flexible tubing.



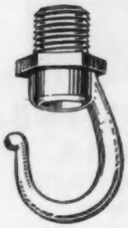


MALE
Hex. Section

CONDUIT BUSHES
Made in the following sizes:
MALE: Electric Thread
⅝" ¾" 1" 1¼" 1½" 2"
FEMALE: Electric Thread
⅝" ¾" 1" 1¼" 1½" 2"



FEMALE
Flat Face Section for Spanner (except ⅝" size, which is round)



CONDUIT HOOK

For fluorescent lamps and overhead lighting fittings. Screwed ⅝" thread, male electric.

Made to fit all standard boxes with two holes 7/32" diameter — 2" centres diametrically opposed. Designed in accordance with British Standard Specification.

Both made in aluminium alloy

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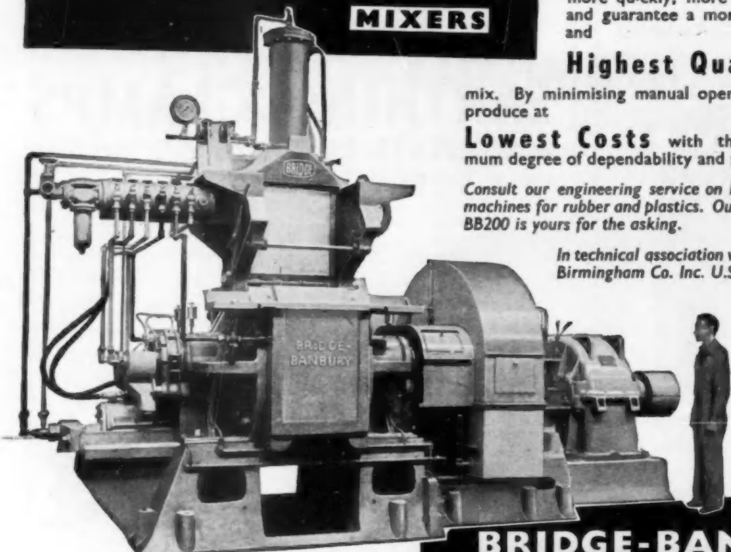

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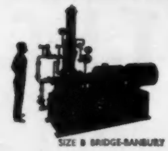
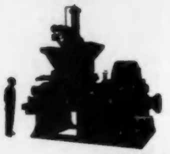
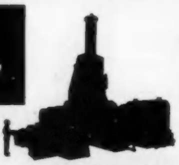


SIZE 8 BRIDGE-BANBURY

SIZE 3A BRIDGE-BANBURY



SIZE 9 BRIDGE-BANBURY



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The design and construction of the synchronous motor provide extraordinary stability and a high degree of self starting efficiency is ensured.

The accuracy and reliability you demand are revealed in

the Anatomy of a Horstmann Time Switch

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20
50
250
HORSTMANN
K Mk II
THE HORSTMANN GEAR CO LTD
BATH ENGLAND

This is the Horstmann Type K Mark II plug-in pattern Time Switch, with synchronous motor driven movement and with switchgear of 20 amps capacity at 200/250 volts, 50 cycles. Models to meet other requirements can be supplied to order.

To meet many different needs, Horstmanns make a large range of Time Switches, but two major requirements are common to all. Time Switches must be *accurate* and they must be *reliable*—able to operate unfailingly under varying conditions of service with scarcely any attention. Horstmanns build these essential qualities into their instruments by employing high grade materials, skilled precision craftsmanship and—half the secret—over 50 years of experience in design and manufacture.

Horstmann Time Switches are used extensively for the control of street lighting, shop window lighting, electric signs, special tariffs—in fact wherever electric current needs to be controlled without human intervention. Such superior instruments compare favourably in price with other time switches but quality has not been sacrificed for cheapness. The best Time Switches are the cheapest in the long run, and Horstmann Time Switches run for a *very* long time.

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HORSTMANN TIME SWITCHES FOR CONTROLLING THINGS ELECTRICAL

HORSTMANN

THE HORSTMANN GEAR CO LTD. BATH. SOMERSET

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Contractors—this is **your** business! **Profitable business** can be obtained by installing Gents' Fire Alarm Systems. Efficient, reliable and economical, simple systems are easily installed which comply with the Factory Act. Where necessary the free services of our Technical experts are available for surveying the premises.

IN CASE OF FIRE BREAK GLASS

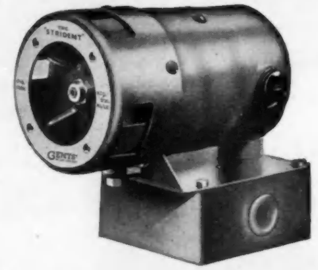
Typical Fire Alarm Contact

Specially designed as a neat, small Fire Alarm Point, with precious metal contacts and substantial springs for **complete** reliability even after years of installation. Each contact will operate a maximum of 3 Strident syrens on 200/250v AC.

PRICE £2. 10s. 0d.

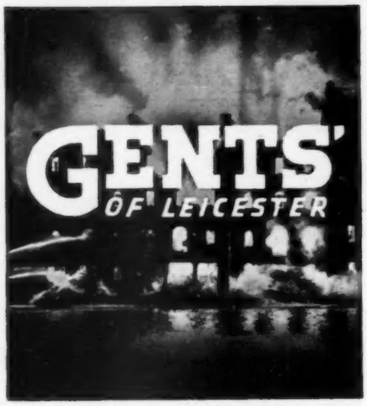
The "Strident" syren is ideal as a Fire Alarm signal and overcomes most noise levels. Only takes ¾ amp with consequent saving in wiring and current consumption. Totally enclosed motor for indoor use only, continuously rated. Base box drilled for ¾" conduit fitted with knockouts and can be turned through 90° to conform to conduit run.

PRICE	200/250 volts AC/DC (¾ amp consumption) 24 volts DC (2 amp consumption)	**£7. 0. 0.**



The "STRIDENT" Syren

Alarms



Our informative booklet "Are You Protected?" will give you further information on installing Gents' Fire Alarm Systems together with sample schemes. Write for your free copy without delay.

FIRE ALARM SYSTEMS

GENT & COMPANY LTD · FARADAY WORKS · LEICESTER
London Office & Showroom : 47 Victoria Street, London S.W.1.

Branches also at:
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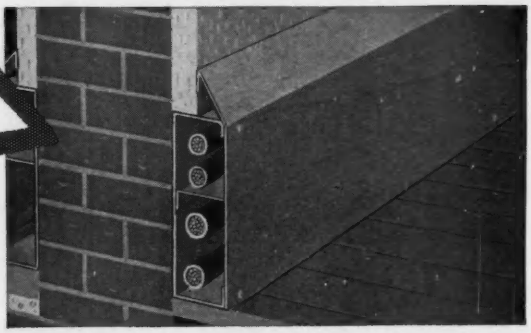
INSTALL CABLES EFFICIENTLY AND SPEEDILY with

BRABY

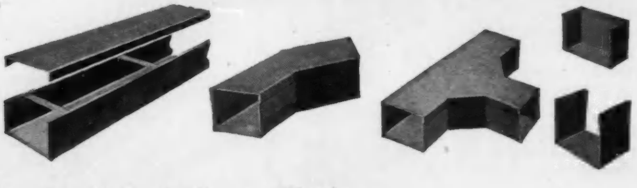
CABLE ACCESSORIES

BRABY perforated Cable Plates and Bends ensure speedy, simplified fixing OR removal of Cables. The plates and bends can be supplied in mild steel—self colour, painted, galvanized after manufacture or plastic coated. Also supplied in aluminium alloy.

BRABY mild steel Trunking protects and conceals cables.



BRABY Cable Accessories are particularly suitable for installations requiring frequent alteration and are widely specified for hospitals, factories, schools, cinemas, offices and in the shipbuilding industry.



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AP270

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In the manufacture of coaxial cable used for the transmission of television signals or telephony a single longitudinal 1.215" x 0.010" soft copper tape is formed into the outer conductor of the coaxial tube.

Extreme accuracy in the dimensions of the tape is necessary as the diameter of the tube so formed must not vary by more than 1 mil from the nominal.

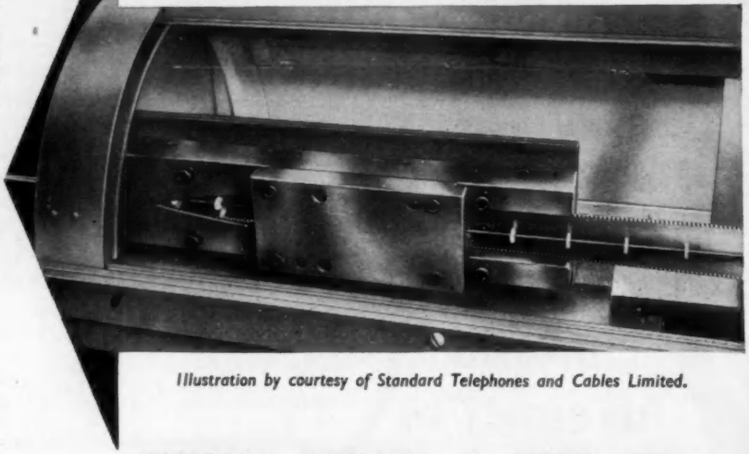

Illustration by courtesy of Standard Telephones and Cables Limited.

THOMAS BOLTON & SONS LTD 175 YEARS SERVICE TO INDUSTRY

The photograph shows the flat copper tape after edge treatment being fed into the forming die to form the outer conductor of the coaxial tube.

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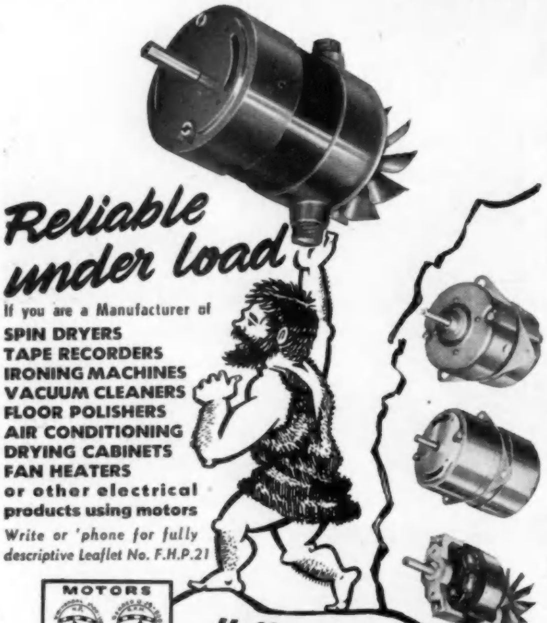

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SWITCH

INSULATED COVER
With or without Pilot Light

30 AMP D.P.
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SWITCH

METAL CLAD
With or without Pilot Light

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Available from your usual wholesale suppliers.

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UNIT

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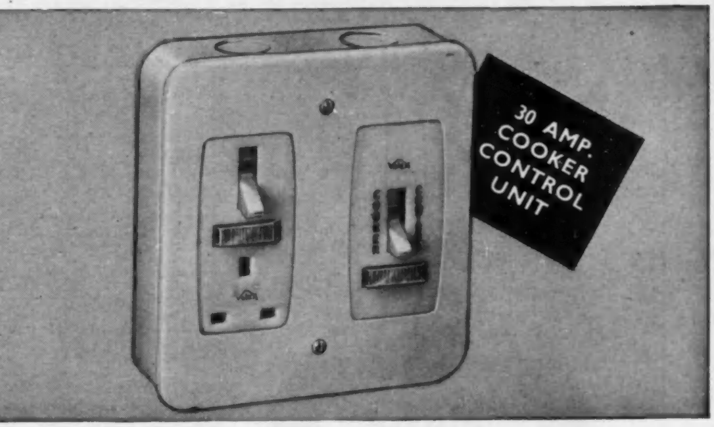
With 13 amp. 3 pin Sub-circuit.
With or without Pilot Light.



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With 13 amp. 3 pin Switched Socket Outlet.
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- **Seam-welded lids which form no exterior ridge, giving increased operating efficiency with reduced dimensions.**
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HUNTS
CAPACITORS
MARK
MADE IN ENGLAND
THERMINOL
CAPACITOR
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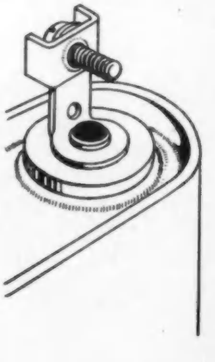
250 V.A.C WKG
LIST No. ZG 104
Type L89/1

★ *As streamlined as the tube itself.*



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Test Voltage:
Capacitors. Up to and including 250 volts A.C. = Wkg volts x 2
above 250 volts A.C. = Wkg volts x 2.5
D.C. Test = A.C. Wkg volts x 3
To Earth, A.C. wkg volts + 1,000 volts A.C. or 2,000 volts A.C. min
Sealing Test: Each Capacitor is heat tested at 80°C
Capacitance Tolerance: Standard limits as shown. Others by arrangement
Power Factor: Better than 0.3% at working volts at 30°C

TYPE L89/1 STANDARD RANGE

Capacitance μF	Volts A.C. wkg.	List No.	Dimensions—inches	
			Length	Cross section of all units
3.2 min	250	ZG101	2	
4 min	250	ZG102	2¼	2.148 x 1.398
5 min	250	ZG103	2⅝	
6 min	250	ZG104	3	
7.4 min	250	ZG105	3⅛	
3.5±5%	400	ZG106	3¼	
6.8±5%	400	ZG107	5⅝	

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Complete with Plugs
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250 volts
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PRECISION CASTINGS IN ALUMINIUM, GUN METAL, GREY IRON, ETC. TO ALL SPECIFICATIONS

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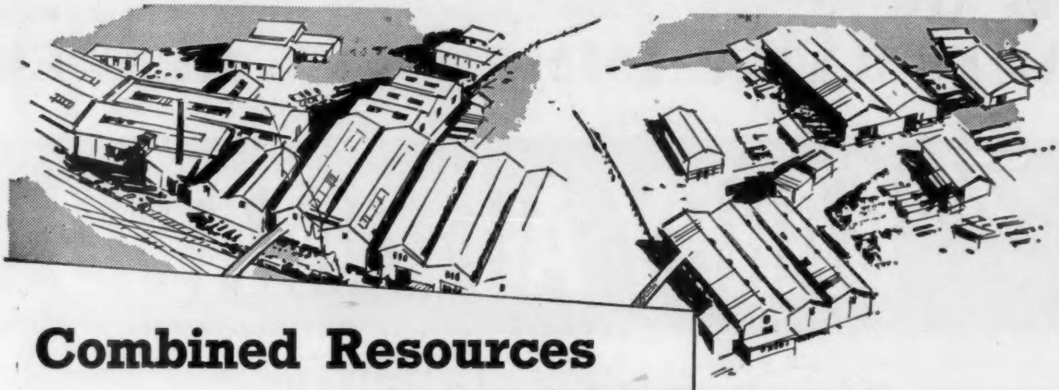

Combined Resources

The combination of General and Britannic — with pooled technical knowledge, research facilities and manufacturing plant — is of immense benefit to both organisations . . . and equally so to their customers! An even wider range of cables of greater fitness-for-purpose can be offered, a more comprehensive and co-operative service can be given to users in any part of the world, and fullest resources maintained to keep abreast of ever-advancing developments and techniques.

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All cables manufactured by General and Britannic conform to the relevant requirements of the British Standards Institution.

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CABLE MANUFACTURING CO. LTD.

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Cables: Isolde, Leatherhead

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CABLES LTD.

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The BARRY AUTOMATIC

(*Patent Applied for*)

- ***Complete and Automatic !!***

NO THERMOSTAT REQUIRED

- FINGER TIP TEMPERATURE CONTROL SETTING

ALL LENGTHS

11, 15, 18, 21, 24, 27, 30 inches

ONE PRICE

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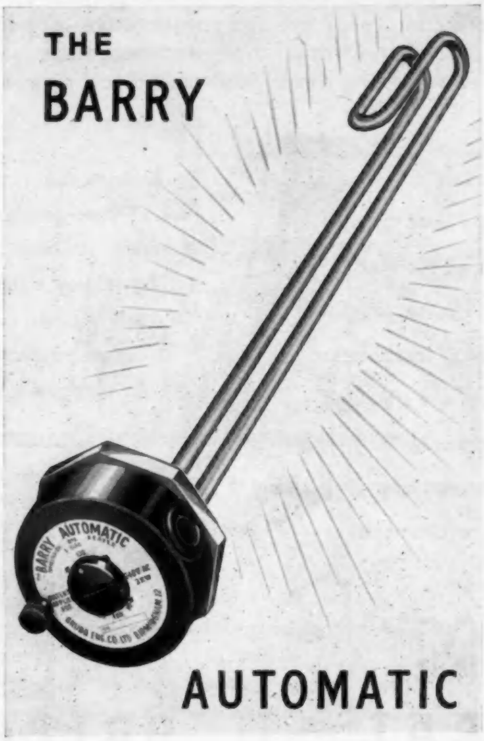
COMPLETE

(Plus Purchase Tax, 12/3)



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- **Best quality embedded element.**
- **Sturdy construction, steel cover, shallow head.**
- **Complete, ready to fit.**
- **2 kW and 3 kW ranges.**
- **Rating, 230/250 V.**
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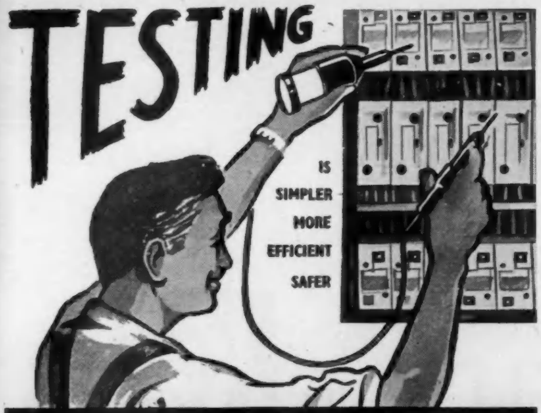

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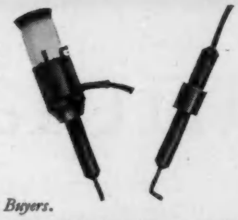

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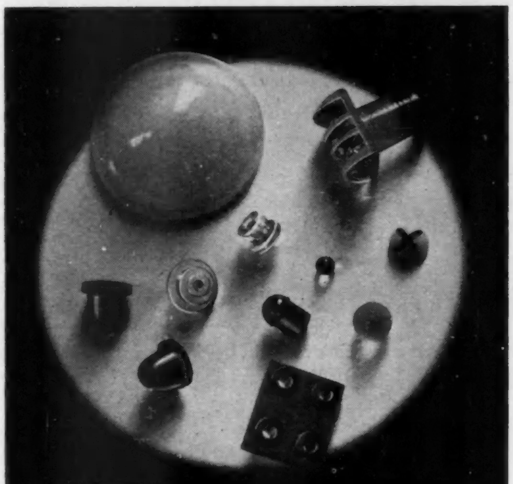

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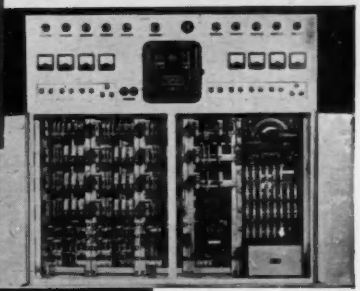
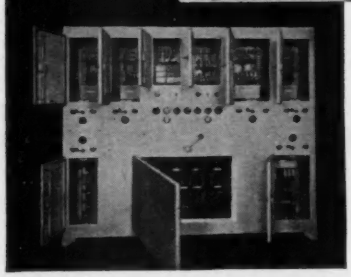


Special purpose panel supplied for the control of an automatic brick-making plant.



Multi-motor control panel with individual compartment and isolation for each motor starter; supplied to a large synthetic fibre manufacturing concern.

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Proprietors: Gibbons Bros. Ltd. & Wild-Barfield Electric Furnaces Ltd. GWB407

1. $D=\frac{K_{DS}\Delta TL^2}{t}$

2. $P=\frac{K_{PS}Dbt^3}{L^3}$

3. $P=\frac{K_{DS}K_{PS}\Delta}{L}$

4. $PD=\frac{K^2{}_{DS}K_{PS}}{4}$

familiar formulæ?

K

5. $D=\frac{K_{DS}\Delta TL^2}{2t}$

6. $P=\frac{4K_{PS}Dbt^3}{L^3}$

7. $P=\frac{2K_{DS}K_{PS}\Delta Tbt^2}{L}$

D
A
P
ΔT
L

Probably not, if you have no interest in thermostatic bimetal. But if you *are* concerned with the design of bimetal elements, perhaps they should be.

These formulæ are taken from our Data Sheet No. 4 "Thermostatic Bimetal". They are an invaluable aid to accurate design calculations for all kinds of bimetal elements—cantilevers, U-shapes, spirals, helical coils and discs.

But this Data Sheet is by no means all formulæ. In addition, it gives the fundamental things you will need to know about the BD-H/Chace range of standard types of thermostatic bimetal. It deals with the applications for which they are suitable, their properties, gives tables of instantaneous deflection constants, and has comparative deflection charts. It also discusses the problems of stress and heat treatment of elements.

If you haven't got our Data Sheet, it could be that you are working at a disadvantage. We will gladly send you a copy.

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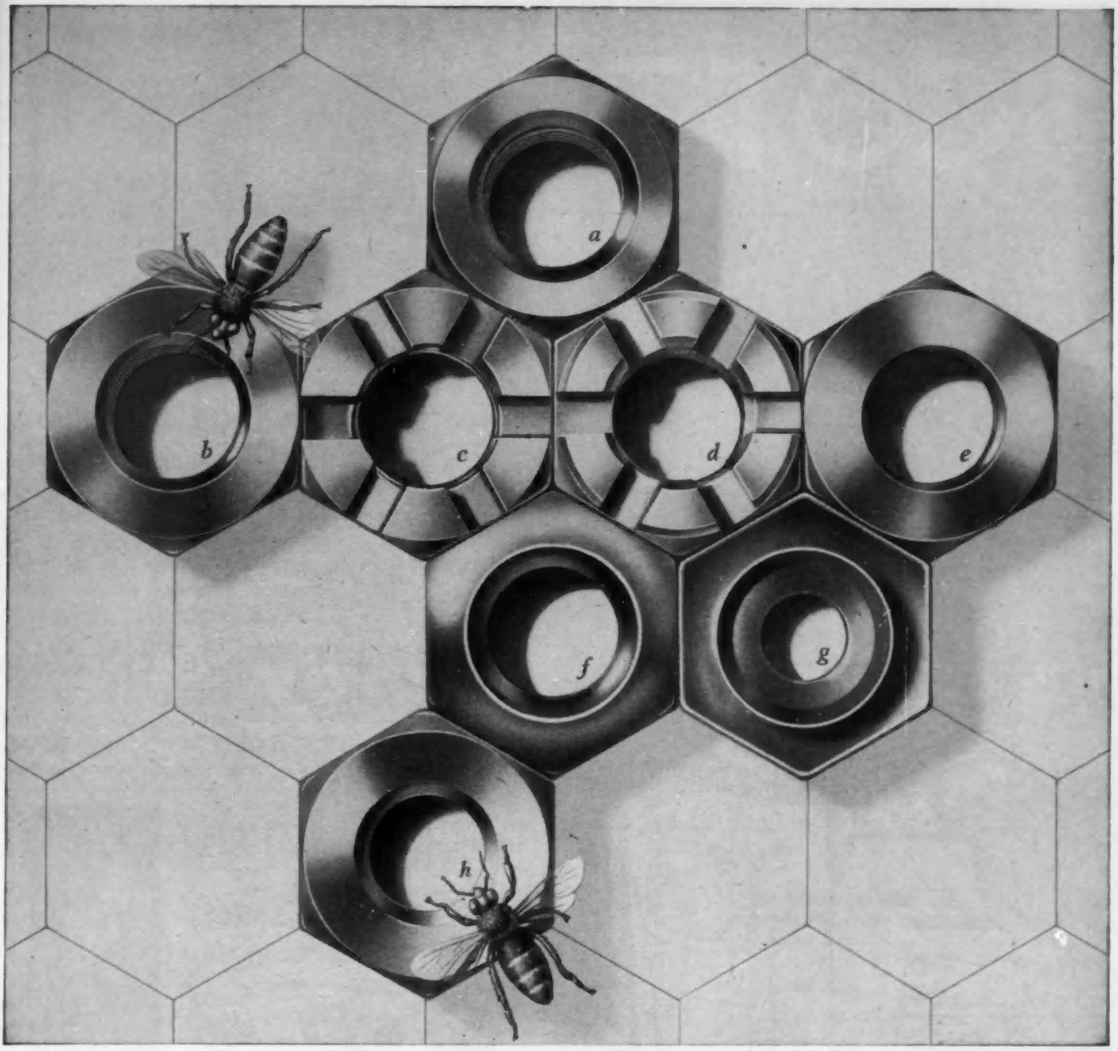

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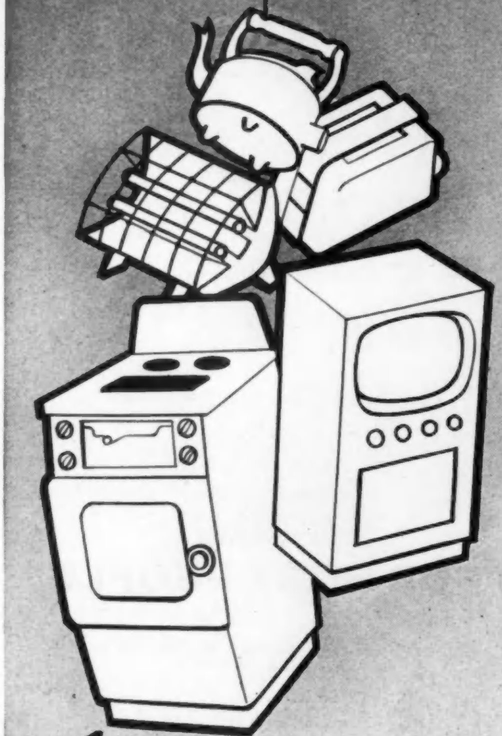

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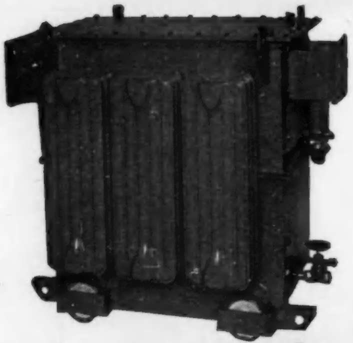

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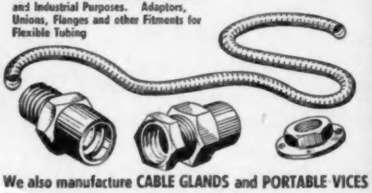

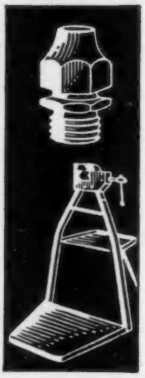

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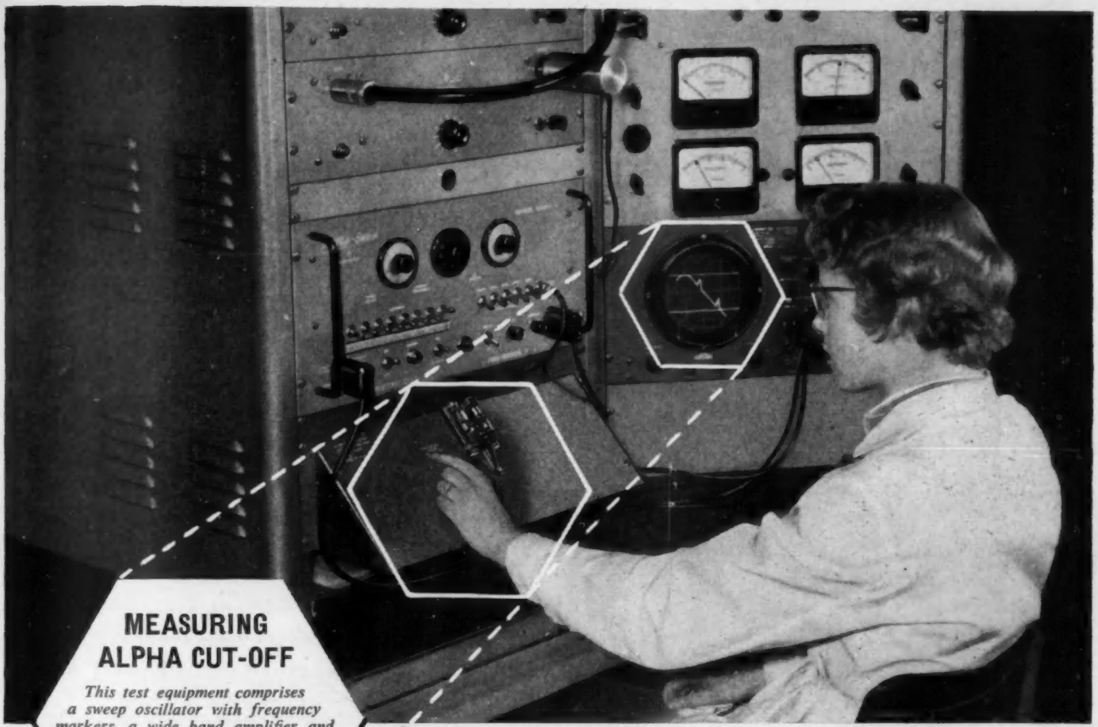

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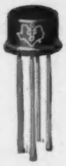


Actual Size

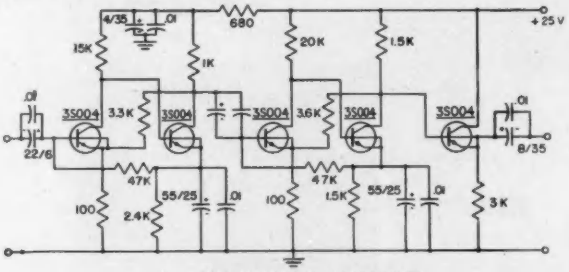
MAXIMUM RATINGS

Collector dissipation at 25°C.	125 mW
Collector dissipation at 100°C.	50 mW
Collector Breakdown voltage	30 volts
Collector current	10 mA

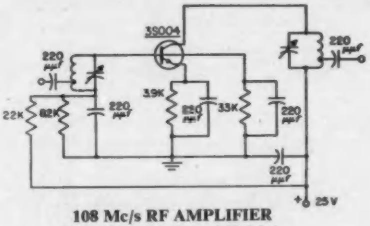
SPECIFICATION

Type No.	*Power Gain*
3S002 (3N34)	16 db (min) at 30 Mc/s.
3S004 (3N35)	18 db (min) at 70 Mc/s.

TWO CIRCUIT EXAMPLES



10 Mc/s VIDEO AMPLIFIER
Measured Power Gain, 53 db. Bandwidth 10 Mc/s. Load Used, 470 Ohms.



108 Mc/s RF AMPLIFIER
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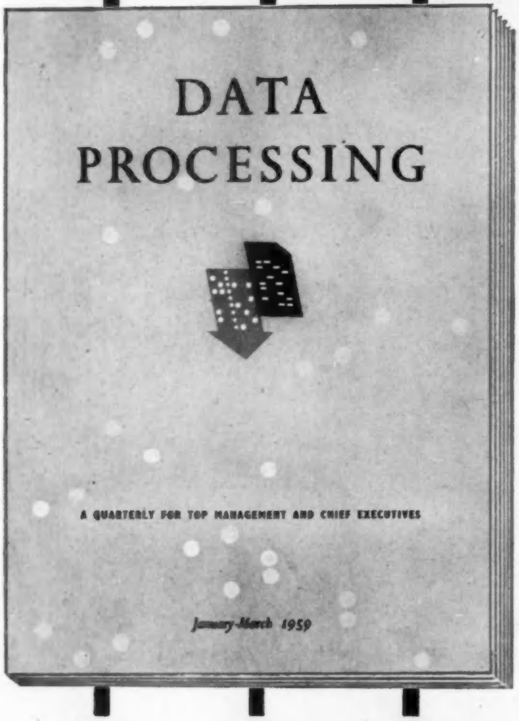

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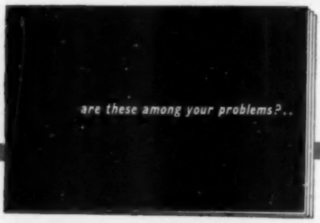

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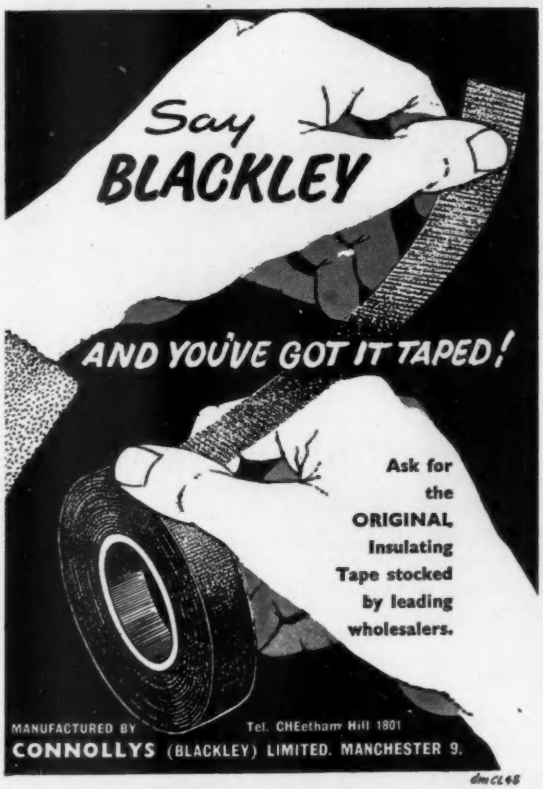
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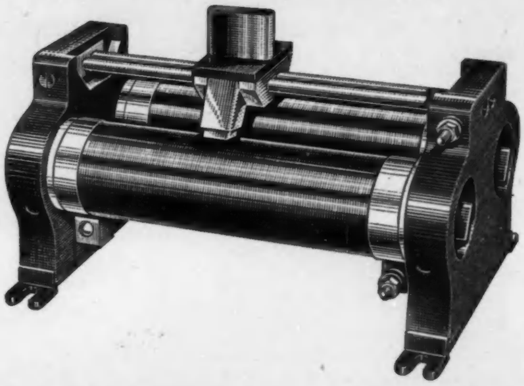

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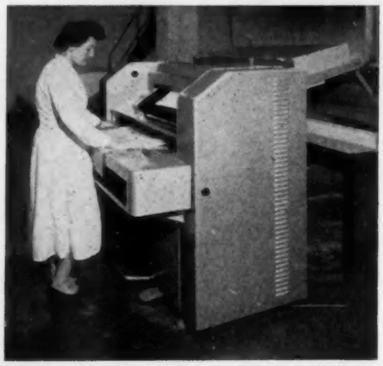

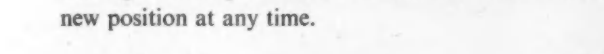

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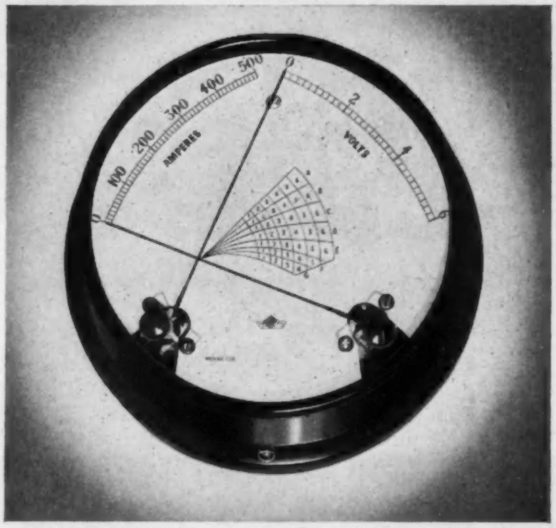

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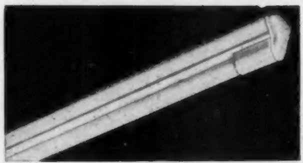

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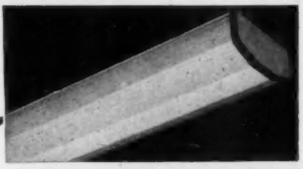

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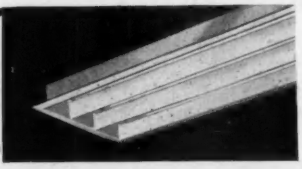
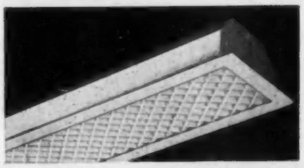


SWAN 35—Triple 5' Recessed Fitting with Remote Tapped Control Gear, Concentric Individual Reflectors. **£16 . 0 . 0.**



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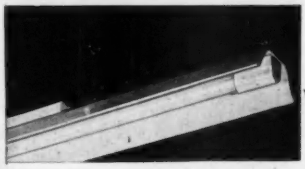

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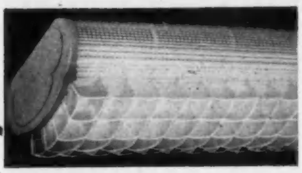

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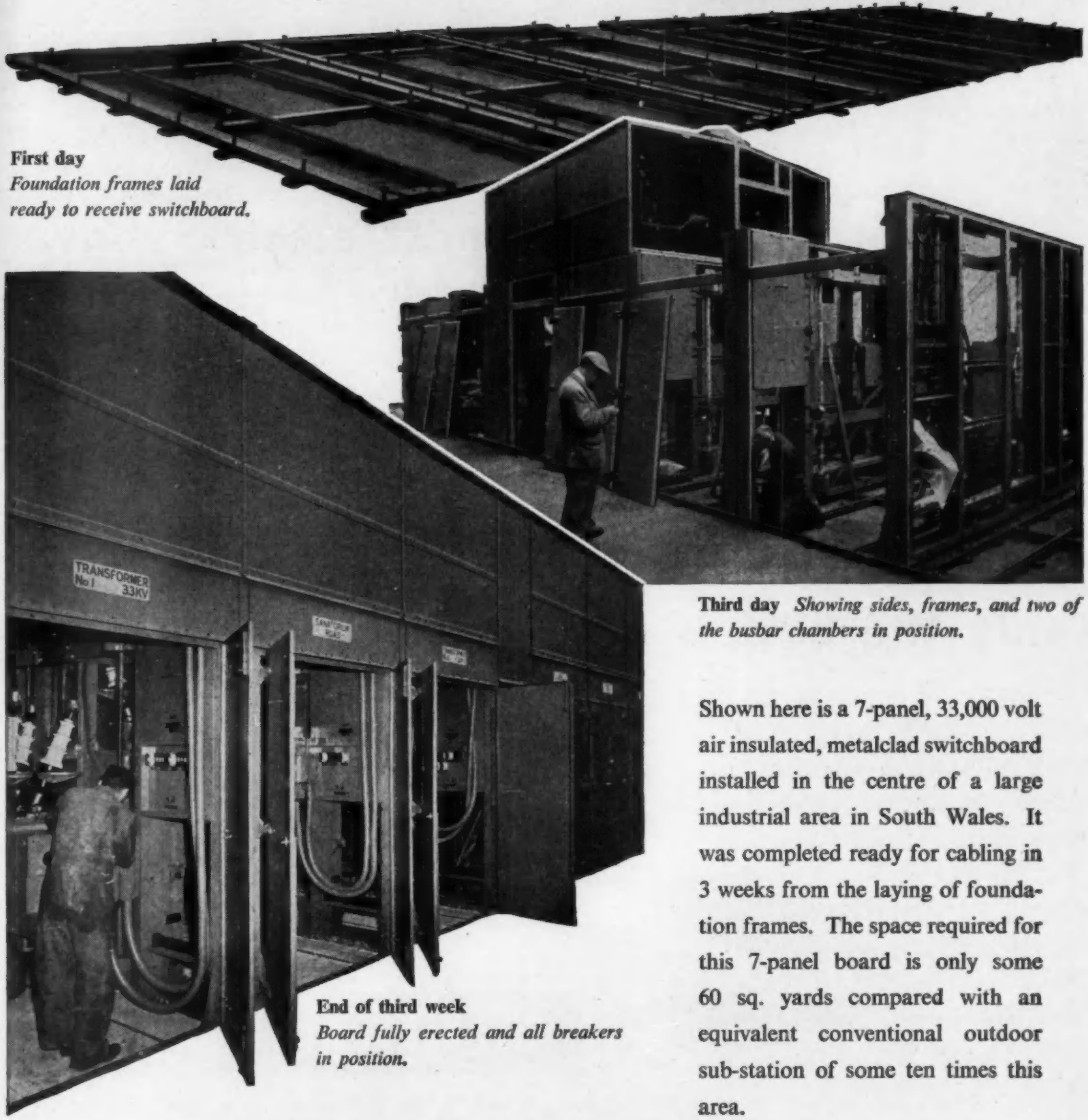
ERMETO designers have developed an immense range of high pressure fittings to suit every conceivable need. If our range does not contain a fitting to suit your purpose do not hesitate to contact us.
Our Technical staff will be pleased to collaborate in the development of any non-standard item.

ERMETO

Details of our standard range of high pressure couplings and valves are available on request.

BRITISH ERMETO CORPORATION LTD · Beacon Works · Hargrave Rd · Maidenhead · Berks
Telephone: Maidenhead 5100 (10 lines)

33 kV OUTDOOR AIR INSULATED SWITCHGEAR
ERECTED IN 3 WEEKS



First day
Foundation frames laid ready to receive switchboard.

Third day *Showing sides, frames, and two of the busbar chambers in position.*

End of third week
Board fully erected and all breakers in position.

Shown here is a 7-panel, 33,000 volt air insulated, metalclad switchboard installed in the centre of a large industrial area in South Wales. It was completed ready for cabling in 3 weeks from the laying of foundation frames. The space required for this 7-panel board is only some 60 sq. yards compared with an equivalent conventional outdoor sub-station of some ten times this area.

SWS

SOUTH WALES SWITCHGEAR LTD.

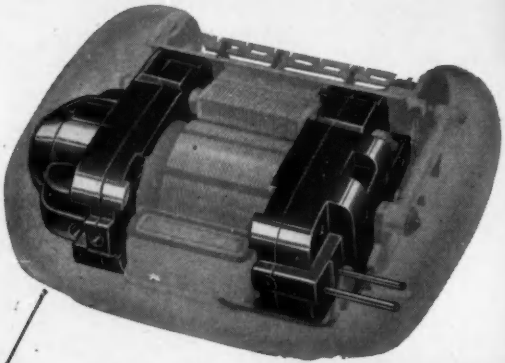
BLACKWOOD · MONMOUTHSHIRE · Works at BLACKWOOD and TREFOREST.

SWITCHGEAR, SWITCHFUSEGEAR, TRANSFORMERS, CONTROL BOARDS

TGA G21

for a most important component

Next to the cutting head the motor which drives it is the most important component in an electric shaver. The mouldings to house the motor are all-important too, if a smooth, trouble-free action is to be achieved.



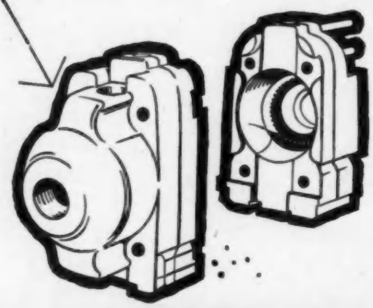
. . . in the world's finest electric shaver

Sunbeam
SHAVEMASTER

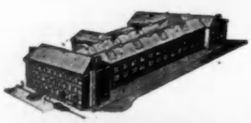
'Not easy mouldings—with metal inserts and holes at all angles and particularly the moulded-in bearing insert. Absolute dimensional accuracy and stability, year in, year out, was essential. It posed quite a problem for our tool makers and technicians but few problems are insuperable to us after over 47 years specialised experience in plastic moulding production.

only the best is good enough

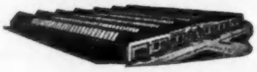
For these transfer mouldings which are illustrated by kind permission of Sunbeam Electric Ltd., we selected a thermo-setting material. Your enquiries would be welcomed.



Walsall Works (Eldon Street)



Walsall Works (Bescot Crescent)

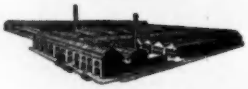


E. Elliott Limited

the plastic moulders with the engineering background

Cheapside Works

Victoria Works (Summer Lane)



315 Summer Lane, Birmingham 19. Tel: ASTon Cross 1156-7-8-9

Mazda

announces a range of

UNIVERSAL

Fluorescent Lamps

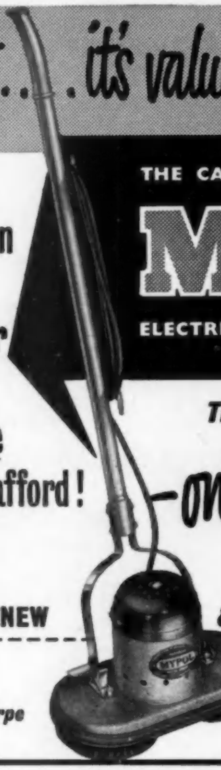
Mazda Universal Fluorescent Lamps from 15 watt to 80 watt in all colours will operate on all normal circuits, whether switch or instant start

Prices and efficiencies as for present Mazda switch start lamps

A.E.I. LAMP AND LIGHTING CO. LTD.

Melton Road, Leicester

It's new... it's value for money, PLUS!



THE CALTHORPE

MYPOL

ELECTRIC POLISHING MACHINE

here's an **electric polisher** at a price everyone can afford!

The complete machine costs

—only £12.17.3 TAX PAID

IT'S BRAND NEW & FULLY GUARANTEED!

The Ideal Polisher for:

- STRIP & PARQUET FLOORS
- PLASTIC or QUARRY TILES
- LINOLEUM
- STAINED OR VARNISHED BOARDS

FOOT OPERATED SWITCH —NO STOOPING

POWERFUL, VIBRATION-LESS FULLY ENCLOSED MOTOR

HIGH GRADE, CLIP-ON POLISHING PADS

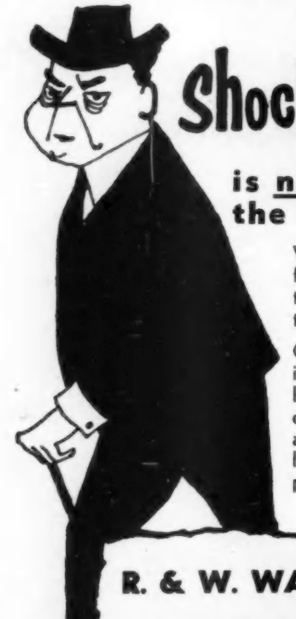
FULLY INSULATED—SAFE IN USE

Another quality Calthorpe appliance

DOWDING & PLUMMER LTD., MANUFACTURING ELECTRICAL ENGINEERS

TRADE ENQUIRIES INVITED
MAXIMUM DISCOUNTS

Write for full details of the 'MYPOL' to:
DEPT. E.R., 2 Jakeman Walk
Birmingham 12 *Telephone: CAL 2805*



Shocking!

is not the word to use

We specialise in papers for electrical cables, transformers, or anything that needs insulation.

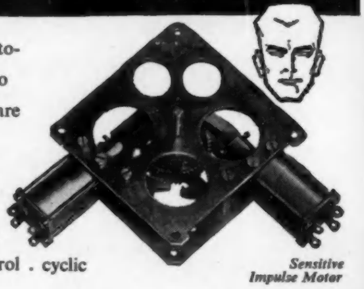
Our papers play an indispensable part in all branches of industry, and our advisory staff is always at your service to help with any particular problem.

R. & W. WATSON LTD.

LINWOOD RENFREWSHIRE SCOTLAND
Telephone: Johnstone 866-9 *Telex 77-255*
LONDON: Northgate House, 20-24 Moorgate, London, E.C.2
Tel.: MONarch 2812. Telex 2-2352
BIRMINGHAM: Lombard House, 144 Great Charles Street, Birmingham 3. Tel.: CENtral 1505
MANCHESTER: 14 St. Peter's Square, Manchester. CEN. 0202

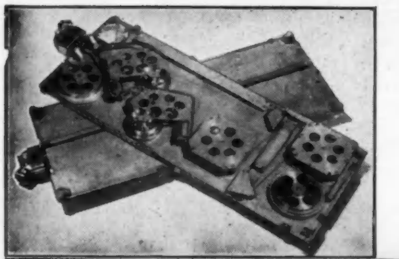
The many minds of *STERLING*

... the intangible automatic minds built into Sterling Instruments are your reliable slaves. Unhampered by human reflex they take care of process timing . cooker control . cyclic processing.



Sensitive Impulse Motor

Navigational Instruments



Sterling Instrument design and assemble to customers' specific needs or build from customers' own drawings.

Send for illustrated descriptive leaflet

STERLING INSTRUMENT
COMPANY LIMITED

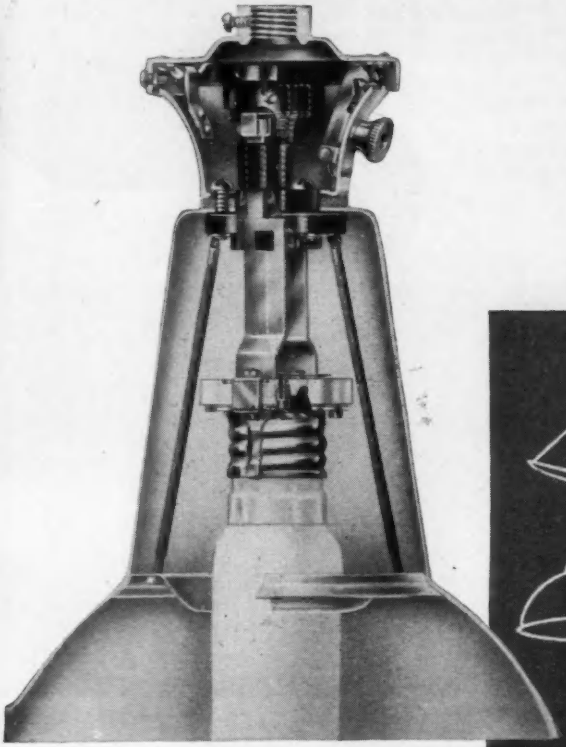
BODEN WORKS
CHARD
SOMERSET
Chard 2341/2
A member of the Sterling Industries Group

[illegible]

Five lampholder assemblies to cover all needs...

simplified stocking with the

MODEL FIFTY RANGE

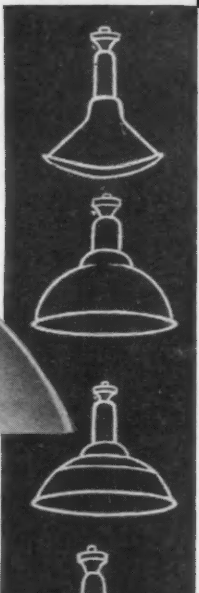


'SAAFLUX' LAMPHOLDER ASSEMBLIES

Only one BC for all reflector types up to 150W.

Only one ES for all reflector types up to 200W.

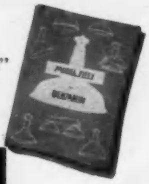
Only three GES for all reflector types 300W. to 1500W.



Five assemblies to cover lighting requirements in the Tungsten Range up to 1500 watts ... 1 BC, 1 ES and 3 GES. This development of the "SAAFLUX" Range demands the attention of stockists, contractors and users alike. Yet simplified stock-keeping is but one facet of these important modifications. Consider these points:

- ✳ **BC and ES lampholder assemblies are interchangeable up to and including 200 watts.**
- ✳ **Contact blades are now in one piece eliminating all possibility of bad contacts.**
- ✳ **One lampholder common to all reflectors for each wattage lamp.**
- ✳ **Improved 'Visor' Cover is dustproof... allows use outdoors and in the wet.**

The informative leaflet: "Model Fifty by Benjamin" will tell you all about it. Please ask for a copy.



BETTER LIGHTING BY BENJAMIN

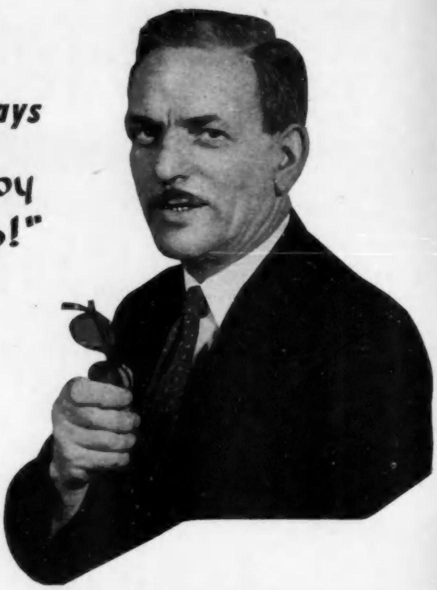
THE BENJAMIN ELECTRIC LIMITED · TOTTENHAM · LONDON · N17
Telephone: TOTtenham 5252 (5 lines) *Telegrams:* Benjalect Southtot London

BIRMINGHAM: 5 Corporation Street, Birmingham 2. *Tel: Midland 5197* · LEEDS: 49 Basinghall Street, Leeds 1. *Tel: Leeds 25579*
BRISTOL: Royal London Buildings, Baldwin Street, Bristol. *Tel: Bristol 28406.*

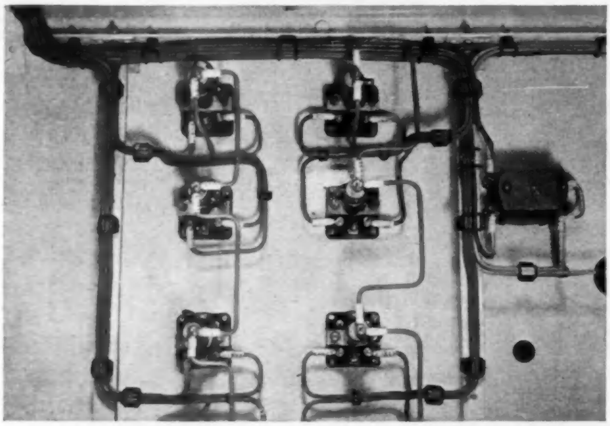
Smee's 137

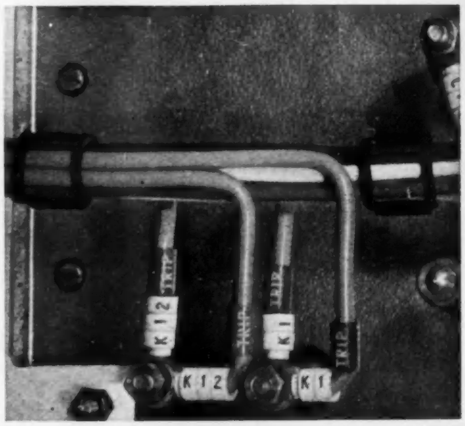
PETERS THE PRODUCTION MANAGER says

"Cradleclip cuts our wiring time by half.... and its twice as good too!"



" And when you consider that wiring is no longer a bottleneck in the production line, you can be sure that here's one Production Manager with no wiring problems since we started to Cradleclip." Mr. Peters has a point, definitely . . . the one . . . two . . . and it's done! slickness of Cradleclip gets the wiring done quicker (52%) and better, and Cradleclip's remarkable versatility in conjunction with all its other outstanding features produces greatly beneficial advantages in every stage of switchgear production and wiring contracts.





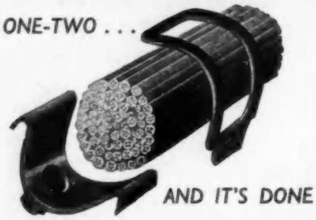
Photographs by kind permission of South Wales Switchgear Ltd., Blackwood, Monmouthshire.

Photograph of Cubicle Control Board, showing CRADLECLIP.

Close-up of CRADLECLIP installation.

JUST LOOK AT THESE CRADLECLIP FEATURES—

Cuts wiring time by 52% *
Combines high speed fixing with simplicity and complete security *
Brings a new versatility, compactness and neatness to your wiring *
Completely insulated and suitable for all climates *
Electrical and mechanical security in all conditions *
Proved in wiring installations throughout the world *



Send for fully descriptive literature on the Insuloid Cradleclip Wiring Systems now and find out about these other Insuloid products for greater cable fixing security and efficiency—
SAS and AS Adjustable Saddles
NX, X and CY Cable Clips
Ring Lock Bushes
Busbar Insulation with P.V.C. Sleeving
Flexiguard Cubicle-to-Door Cable Trunking

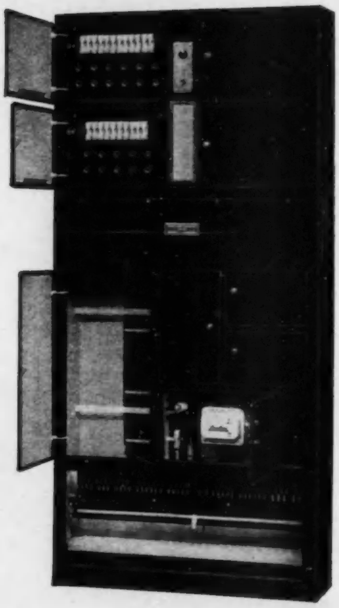
Insuloid cradleclip

twice as good . . . twice as quick . . . when you wire with CRADLECLIP

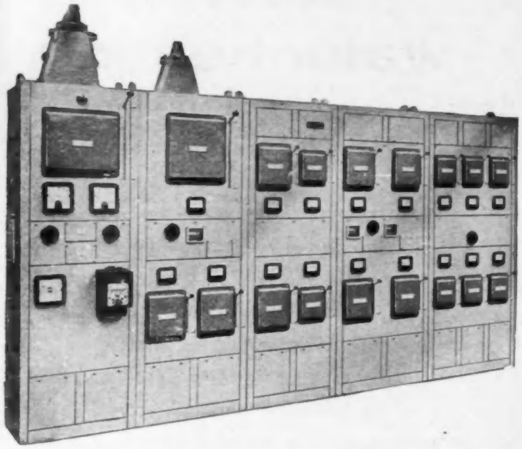
INSULOID MANUFACTURING COMPANY LIMITED
Sharston Works Leestone Ave. Wythenshawe Manchester
Tel : Wythenshawe 2842 & 3163

AEROFLEX Fluvent CUBICLE TYPE SWITCHBOARDS

The name FLUVENT has been associated with advanced Switchboard design since the beginning of the century and the name AEROFLEX has been synonymous with high breaking capacity Fuses since they were first introduced in the early 1920's.



An unusual Cubicle Board (right) which provides a variety of lighting fuseboards with tumbler switch panels. It is installed in St. George's Chapel, Windsor.



Installed in a modern manufacturing undertaking, this Board (above) protects one 300 amp. eight 100 amp. and eight 60 amp. 3 phase 4 wire outgoing circuits, and the incoming Cubicle on the left is provided with a 600 amp. main switch and metering facilities.

A compact Board (right) protecting one 300 amp. and two 60 amp. 3 phase 4 wire circuits and six 30 amp. single phase and neutral circuits, all under the control of a 600 amp. T.P. and Neutral incoming main switch.

Fluvent
SWITCHBOARDS

Publication SB3 illustrates and describes a selection of Cubicle and Unit Type Switchboards. A copy will be forwarded to you on request.

Parmiter Hope & Sugden Ltd.

FLUVENT ELECTRICAL WORKS · LONGSIGHT · MANCHESTER 12

London: 34 Victoria Street, S.W.1. Glasgow: 5 Somerset Place, C.3. Birmingham: 39/41 Carrs Lane, 4.

dmPH149

It's high time

we saw the

G.E.C.

about

water heating

If your washroom hot water system is inadequate . . . inefficient . . . expensive to maintain . . . then see the G.E.C. without delay. However complicated the system the G.E.C. can solve your problem . . . solve it with an industrial electric water heating installation—fume-free, dust-free and thermostatically controlled to keep the water, economically, at the required temperature.

G.E.C.

INDUSTRIAL ELECTRIC WATER HEATING

The Company's specialist engineers are ready to give free advice and to recommend the most suitable system.

industrial storage water heaters—
for hot water in quantity to a number of points at a time.

industrial immersion heaters—
for quick and easy conversion of fuel fired systems to electric heating.

For further information, write for publication H 4.

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

Classified Advertisements

CLASSIFIED advertisements are PREPAID at 3/6 per line (approx. 6 words) per insertion. Where an advertisement includes a Box Number there is an additional charge of 1/-.

DISPLAYED CLASSIFIED:—48/- per inch. Cheques and Postal Orders should be crossed and made payable to ELECTRICAL REVIEW PUBLICATIONS LTD.

SERIES DISCOUNTS for consecutive insertions:—13, 5%; 26, 10%; 52, 15%.

SITUATIONS WANTED:—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

REPLIES to Box Numbers should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1, but if not to be delivered to any particular firm or individual they should be accompanied by instructions to this effect, addressed to the Manager of the ELECTRICAL REVIEW. Replies in such cases cannot be returned. The name of an advertiser using a Box Number will not be disclosed.

ADVERTISEMENTS are accepted up to **First Post on Monday** of the week of issue and should be addressed to ELECTRICAL REVIEW, Classified Advertisement Department, Dorset House, Stamford Street, London, S.E.1.

Original testimonials should not be sent with applications for employment

---

OFFICIAL NOTICES, TENDERS, ETC.

BOROUGH OF KETTERING

Street Lighting: Trunk Road A.6

TENDERS are invited for the provision of 22 400-watt Mercury Vapour and 33 3 × 80-watt Fluorescent Lighting units on Steel Columns in connection with the improved lighting of a section of Trunk Road A.6.

Tenderers may quote for:—

(a) The supply only of lanterns, auxiliary gear and lamps.
(b) The supply of columns with erection, wiring and fitting of electrical equipment supplied by another firm.
(c) The whole of the work.

General conditions of contract and plans may be inspected, and specification, bills of quantities and forms of tender obtained from the Borough Engineer and Surveyor's Office, 3, Gold Street, Kettering, on payment of a deposit of £2 2s., which will be refunded on receipt of a bona fide tender and the return of all documents.

Tenders in plain sealed envelopes endorsed "Lighting Scheme, Trunk Road A.6" must be delivered to the undersigned not later than noon on Friday, 28th November, 1958.

The Council do not bind themselves to accept the lowest or any tender.

D. DUNSFORD PRICE,
Town Clerk.
Council Offices,
High Street, Kettering.
28th October, 1958. 5350

FAREHAM URBAN DISTRICT COUNCIL

Street Lighting: Trunk Road A.27

TENDERS invited for supply and erection of Group A Street Lighting installation for approximately 1,650 yards of Trunk Road as under:—

Section A (a) Supply and erection of steel columns and fitting and wiring electrical equipment, etc., offered in firm's own tender.

(b) Supply and erection of steel columns and fitting and wiring electrical equipment, etc., provided by another firm.

Section B. Supply of lanterns, lamps and electrical equipment.

Specification, bill of quantities and forms of tender obtainable from, and conditions of contract and drawings inspected at, office of Engineer and Surveyor, Westbury Manor, Fareham, Hants, on payment of deposit of £2, returnable on receipt of bona fide tender, not subsequently withdrawn, and return of all documents.

Tenders in envelopes provided and endorsed "Tender for Street Lighting" to be by 10 a.m. Friday, 21st November, 1958.

The Council do not bind themselves to accept the lowest or any tender.

B. W. RANDS,
Clerk to the Council.
Merton,
5, Grove Road,
Fareham, Hants. 5351

SITUATIONS VACANT

PLANT ELECTRICAL DRAUGHTSMAN

H.Q. Factory Engineering Department of a large industrial group require:—

PLANT ELECTRICAL DRAUGHTSMAN specialising in H.T. and L.T. substations, cabling power and lighting.

Qualifications to include works apprenticeship, H.N.C. or equivalent, and experience in layout and installation of works plant.

Salary £850/£950 per annum.—Box 5389.

SOUTHERN ELECTRICITY BOARD

Assistant Engineer (Planning)

Sub-Area Engineering Department of No. 1 (Southall) Sub-Area, located at Waterloo Road, Uxbridge. Salary N.J.B. Class L, Grade 13 (£885-£930 per annum, inclusive of London allowance). N.J.B. conditions of service.

The duties of the post will be to assist in the preparation of schemes and estimates for extensions and/or reinforcements to overhead and underground H.V. and L.V. networks.

Applications on forms obtainable from the Sub-Area, Secretary, 2/6, Windmill Lane, Southall, Middlesex, and returned to him, quoting Z.934, not later than 17th November, 1958.

Assistant Engineer (Planning)

Swindon District of No. 2 (Newbury) Sub-Area. Salary N.J.B. Class F, Grade 11 (£685-£730 per annum). N.J.B. conditions of service.

The duties of the post will be to assist the Planning Engineer in the preparation of schemes and estimates for extensions of and reinforcement to overhead and underground H.V. and L.V. networks, and to undertake standby duties if required. Suitable technical qualifications are necessary.

Applications on forms obtainable from the Sub-Area Secretary, 7, Oxford Road, Newbury, Berks, and returned to him, quoting Z.961, not later than 17th November, 1958.

Draughtsman (Civil Engineering)

Sub-Area Engineering Department of No. 1 (Southall) Sub-Area, located at Waterloo Road, Uxbridge. Salary N.J.B. Schedule D, Grade 6 (£625-£755 per annum, inclusive of London allowance). N.J.B. conditions of service.

Applicants must have had training and experience in building construction and the design of steelwork and reinforced concrete structures.

Applications on forms obtainable from the Sub-Area, Secretary, 2/6, Windmill Lane, Southall, Middlesex, and returned to him, quoting Z.958, not later than 17th November, 1958.

General Assistant Engineer

North Sub-Section, Sub-Area Engineering Department of No. 2 (Newbury) Sub-Area. Salary N.J.B. Class L, Grade 18 (£590-£635 per annum). N.J.B. conditions of service.

The duties of the post will be to assist in the carrying out of the installation and erection of plant, equipment and overhead lines, the laying of cables and other constructional work on all distribution systems up to and including 33 kV.

Applications on forms obtainable from the Sub-Area Secretary, 7, Oxford Road, Newbury, Berks, and returned to him, quoting Z.960, not later than 17th November, 1958.

General Assistant Engineer

Aldershot District of No. 3 (Portsmouth) Sub-Area, located at Petworth. Salary N.J.B. Class G, Grade 13 (£590 × £15 to £635 per annum). N.J.B. conditions of service.

Applicants will be required to assist in distribution duties, including minor construction work and general maintenance of H.V. and L.V. overhead and underground distribution systems, substation plant, etc., and possess suitable technical qualifications. The appointment will involve standby duties.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him, quoting Z.959, not later than 17th November, 1958.

The successful candidates for the above appointments will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible. 5388

YORKSHIRE ELECTRICITY BOARD

No. 1 (Bradford) Sub-Area

KEIGHLEY DISTRICT
SECOND ASSISTANT DISTRICT ENGINEER.

Applicants should have technical qualifications equivalent to those required for Corporate Membership of the Institution of Electrical Engineers and have experience in the design, construction, maintenance and operation of alternating current H.V. and L.V. underground and overhead distribution systems both in urban and rural areas, substation plant and ancillary equipment. Experience of substantial M.V. direct current distribution will be an advantage.

Salary N.J.B. Class F, Grade 7, £885/£15/£930 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 1 (Bradford) Sub-Area, Yorkshire Electricity Board, 45/53, Sunbridge Road, Bradford, not later than 21st November, 1958.

No. 5 (Wakefield) Sub-Area

BARNSLEY DISTRICT
ASSISTANT CONSUMERS' ENGINEER.

Applicants should have a sound technical training and practical experience of industrial, commercial and domestic installations. The duties will be concerned with consumers' supply and tariff queries and will include the carrying out of negotiations with consumers for new and additional supplies and advising on the utilisation of electricity. Preference will be given to applicants holding a Higher or Ordinary National Certificate in Electrical Engineering or some other approved qualification.

Salary N.J.B. Class H, Grade 10, £835/£15/£880 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a, Denby Dale Road, Wakefield, not later than 21st November, 1958.

5386

SOUTH OF SCOTLAND ELECTRICITY BOARD

Glasgow Area

Third Assistant Engineer, Construction

APPLICATIONS are invited to fill the above vacancy at Area Headquarters. Applicants should have a sound theoretical knowledge and practical training with experience in the erection and commissioning of E.H.V. switchgear, transformers and protective gear and general substation construction work.

Graduateship of the Institution of Electrical Engineers or equivalent qualification is desirable.

The conditions of employment will be in accordance with the National Joint Board Agreement for the Electricity Supply Industry. The position is superannuable.

Salary scale Class L, Grade 10, £995-£1,055 per annum.

The successful candidate will require to reside within reasonable distance of Area Headquarters.

Applications on the standard form, which may be obtained from the undersigned, should be completed and returned not later than fourteen days from the appearance of this notice.

A. KELSO,
Manager.
P.O. Box 6,
75, Waterloo Street,
Glasgow, C.2.
22nd October, 1958. 5361

Situations Vacant *(continued)*

SOUTH EASTERN ELECTRICITY BOARD

SENIOR ASSISTANT ENGINEER, Mid-Sussex Area Headquarters.

Salary £1,560 × £35 to £1,665 p.a. under N.J.B. Class K, Grade 3. Superannuable. Applicants should be Corporate Members of the I.E.E. and have had a sound training in distribution engineering followed by experience in the construction, operation and maintenance of overhead and underground systems up to 33 kV.

Applications, quoting reference No. E.R., and naming two referees, to Mid-Sussex Manager, SEEBOARD, Mid-Sussex House, North Road, Brighton, 1, by 19th November, 1958.

DISTRICT ENGINEER,
Central Sussex District.

Salary £1,160 p.a. rising to £1,236 p.a. under N.J.B. Class F, Grade 3. Superannuable. Applicants should be qualified engineers with sound knowledge of all aspects of the work of a District Engineering Department. Experience should include the planning, construction, operation and maintenance of underground and overhead systems up to 33 kV. The successful candidate will be required to reside within the district and may elect to have a service tenancy of a Board's flat.

Applications, quoting reference No. E.R., and naming two referees, to Central Sussex Manager, SEEBOARD, Electra House, Church Road, Haywards Heath, Sussex, by 19th November, 1958.

JOINTERS (Extra High Tension),
West Kent District.

Wages 5s. 0½d. per hour plus 8s. 3d. per week productivity award after one month's service for 44-hour 5-day week under N.J.I.C. Agreement. Applicants should be experienced in all classes of medium voltage and 11,000-volt jointing on underground cables, including transformer and switchgear connections and M.V. fuse units, disconnecting boxes, etc.

Applications, quoting reference No. E.R., and naming two referees, to District Manager, SEEBOARD, 286, High Street, Orpington, Kent, by 19th November, 1958.

DEMONSTRATOR,
Sevenoaks and Reigate District.

Salary £525 × £20 to £625 per annum under N.J.C. Grade 1. Superannuable. Applicants should have diploma or certificate in domestic science, also E.A.W. Certificate. Duties include lecturing, demonstrating advising consumers and generally assisting in any of the District's showrooms.

Applications, quoting reference No. E.R., and naming two referees, on forms to District Manager, SEEBOARD, Electric House, West Hill, Oxted, by 19th November, 1958.

SHOWROOM ASSISTANT (MALE),
Dorking and Epsom District.

Salary £205-£505 or £590 plus London weighting, according to age and qualifications. Superannuable. Duties include general showroom and cashier work. Sales experience is necessary. Primarily for Epsom showroom, the successful applicant must be prepared to work in any of the Dorking and Epsom District showrooms.

Applications, quoting reference No. E.R., and naming 2 referees, on forms to District Manager, SEEBOARD, 56, South Street, Dorking, by 19th November, 1958.

GEORGE WRAY,
Secretary. 5387

M.K. ELECTRIC LIMITED

REQUIRE EXPERIENCED SALES

REPRESENTATIVE

FOR CENTRAL AND WEST LONDON

If you have experience in dealing with architects, electrical wholesalers and contractors, are a car owner and would like to join the sales team of a progressive company marketing products with a world-wide reputation, we would like to hear from you in confidence.

Write in the fullest detail to:—

The Sales Manager
M.K. ELECTRIC LTD.
London, N.18

5392

CENTRAL ELECTRICITY GENERATING BOARD

London Division

APPLICATIONS invited for following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A. Salary includes London allowance. Qualifications entitling to Graduate Membership of I.E.E. or I.Mech.E. an advantage.

STATION SHIFT CONTROL ENGINEER,
BARKING "C" POWER STATION
(Vacancy No. 58/894).

Sound technical training with experience in control and operation of modern generating plant and E.H.T. switchgear. Salary Class J, Grade 10 = £935 plus £88 10s. shift p.a.

ASSISTANT ENGINEER (Operation),
BLACKWALL POINT
POWER STATION
(Vacancy No. 58/895).

Sound technical training with experience of modern power station plant operation, preferably pulverised fuel fired. Will be required to take over duties of other shift engineers for relief purposes. Salary Class F, Grade 9 = £830 plus £79 shift p.a.

STATION SHIFT CONTROL ENGINEER,
BLACKWALL POINT
POWER STATION
(Vacancy No. 58/896).

Sound technical training necessary with experience in control and operation of modern generating plant and E.H.T. switchgear. Salary Class F, Grade 10 = £780 plus £74 shift per annum.

MAINTENANCE ENGINEER (Mechanical),
BLACKWALL POINT
POWER STATION
(Vacancy No. 58/897).

Wide experience necessary in maintenance of modern generating plant. Duties will include co-ordination of maintenance of the boiler house, turbine house, coal handling plant, etc. Character and ability to supervise staff is important. Salary Class F, Grade 6 = £985 p.a.

ASSISTANT ENGINEER (Operation),
FULHAM POWER STATION
(Vacancy No. 58/898).

Sound technical training with experience of large power station plant operation. Will be required to take over duties of other shift engineers for relief purposes. Salary Class K, Grade 9 = £1,045 plus £99 10s. shift p.a.

Applications, quoting vacancy number, to (or on form from) Central Electricity Generating Board, London Division, P.O. Box 136, London, W.1, by 17th November, 1958. 5364

ELECTRICAL ENGINEER

required by

THE UNITED KINGDOM
ATOMIC ENERGY AUTHORITY

Industrial Group

at its

EXPERIMENTAL REACTOR
ESTABLISHMENT, DOUNREAY

to be responsible for maintenance and control of E.H.V., H.V. and L.V. distribution and generating equipment.

A recognised engineering apprenticeship and Corporate Membership of the Institution of Electrical Engineers, or equivalent, together with good experience of the maintenance and operation of high-rupturing capacity switchgear and associated protection equipment are essential. Power plant experience would be an advantage.

Salary between £1,300 and £1,740 according to qualifications and experience.

Contributory pension scheme.

There is a staff housing scheme.

Send postcard for application form, quoting reference 2604, to Establishments Officer, D.E.R.E., Dounreay, Thurso, Caithness, Scotland. Closing date 17th November, 1958.

5334

CITY OF SALISBURY, SOUTHERN RHODESIA

Electricity Department

Vacancy for Electrical Engineers, Grade 1, Salary Scale £1,575 × £50 to £1,725 p.a.

APPLICATIONS are invited for the position of ELECTRICAL ENGINEER GRADE 1 on the salary scale £1,575 × £50 to £1,725 p.a., commencing salary at the minimum of the grade. No cost-of-living or other allowances are payable.

Candidates should possess a Degree in Electrical Engineering or the equivalent, and/or be Corporate Members of the British Institution of Electrical Engineers, and have had at least 15 years' experience in the design, erection and maintenance of indoor and outdoor substations, transformers, switchgear, protection, etc., up to and including 33,000 volts. Experience on 88-kV equipment will be an advantage.

The position is a senior post and the selected candidate will be in charge of the substation section of the Distribution Department of an undertaking covering approximately 600 square miles and some 950 substations, with a present system maximum demand of 110 MW; experience in general distribution work and in the control of staff in an organisation of similar size is essential.

The appointment will be subject to the Council's Service and Leave Regulations as amended from time to time. The successful applicant will be required to submit a satisfactory medical certificate of fitness and to serve a probationary period of six months. He must also be able to comply with the requirements of the Immigration Authorities.

Applicants are requested to submit full particulars of their qualifications, training and experience, giving details of positions held and salaries received, marital state, age, place of birth, and nationality. Copies of not more than three recent testimonials may be included.

Further particulars, including a summary of conditions of service, leave entitlement, allowances towards travelling and removal expenses, etc., are obtainable from Davis & Soper Ltd., 52-54, St. Mary Axe, London, E.C.3, to whom applications must be submitted on or before 5th December, 1958. 5353

GENERAL ELECTRIC COMPANY LIMITED

Atomic Energy Division

Civil, Mechanical and Electrical Senior Site Engineers

APPLICATIONS are invited from engineers to supervise the construction of atomic power stations.

Applicants should have had previous experience on large construction projects and a degree or membership of one of the senior institutions is desirable.

These positions, which are permanent and pensionable, give opportunity to those able and willing, for consideration for posts of high responsibility and appropriate remuneration.

Application, giving full details of qualifications and experience, should be made to:—

Personnel Manager (D.W.T.A.)
THE GENERAL ELECTRIC CO. LTD.
Fraser and Chalmers Engineering Works
Erith, Kent

5390

KENT EDUCATION COMMITTEE

North-West Kent College of Technology

APPLICATIONS are invited for an appointment as LECTURER in Electrical Engineering, duties to commence on 1st January next, or as soon as possible thereafter.

Applicants should be Graduates in Electrical Engineering and/or Corporate Members of the Institution of Electrical Engineers. Industrial experience in connection with electrical machinery or electrical power supply is desired; teaching experience would also be advantageous.

Salary in accordance with the Burnham (F.E.) Scale for Lecturers is £1,200-£1,350 p.a.

Further particulars and forms of application may be obtained from the Principal at the College, Miskin Road, Dartford, Kent. 5331

CENTRAL ELECTRICITY GENERATING BOARD

East Midlands Division

APPLICATIONS are invited for the following appointments in this Division:—

ASSISTANT SHIFT CHARGE ENGINEER,
DRAKELOW "A" POWER STATION
(Vacancy No. 159/58/ER).

Applicants should have suitable technical qualifications and experience in power station operation.

Salary will be within Class J, Grade 8 (£995-£1,055 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications, 12th November, 1958.

SHIFT CHARGE ENGINEER,
BURTON-ON-TRENT
POWER STATION
(Vacancy No. 164/58/ER).

A sound technical training and practical experience in the control and operation of steam generating plant and main switchgear are required. Appropriate qualifications an advantage.

Salary will be within Class E, Grade 7 (£835-£880 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications, 19th November, 1958.

These appointments will be pensionable under the terms of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Divisional Establishments Officer, Central Electricity Generating Board, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. PLEASE QUOTE VACANCY NUMBER.

O. S. WOODS,
Divisional Controller.

29th October, 1958. 5363

RAILWAY SIGNALLING

METROPOLITAN-VICKERS
ELECTRICAL CO. LTD.

require

ENGINEERS

for work on signals, track apparatus, relays, relay racks, control panels, remote control systems, automatic train control, automatic control of marshalling yards, etc.

Although previous experience of this type of work is not essential, it would be an advantage for applicants to be familiar with modern railway signalling apparatus.

The minimum engineering qualification required is the Higher National Certificate.

These posts, which are pensionable, are based on the company's Trafford Park factory.

Applications, quoting F.12, should be sent to :—

Personnel Manager
METROPOLITAN-VICKERS
ELECTRICAL CO. LTD.
Trafford Park, Manchester, 17

5356

FREDERICK S. SNOW & PARTNERS

require

ELECTRICAL ENGINEERING ASSISTANTS

for design, specification and detailing of power distribution, electrical installations, comprising heating, lighting and power in industrial and commercial buildings.

SENIOR and INTERMEDIATE GRADES to H.N.C. standard or equivalent.

JUNIOR GRADES to O.N.C. standard with apprenticeship or equivalent training.

Write stating age, experience and salary required to—

Monro Building, Wellington Street,
London, W.C.2 5391

ELECTRICITY AUTHORITY OF CYPRUS

APPLICATIONS are invited for the following posts. Appointment for two tours each of two years with prospects of permanency, or in certain circumstances on temporary terms. Superannuation scheme. Outfit and settling-in allowances £35 (£75 if accompanied by wife). Children's educational grants in certain circumstances. Free passages and furnished quarters. Liberal leave on full salary.

STATION SUPERINTENDENT
(M2C/42690/EF).

Salary (including bonus and overseas and temporary allowances) £2,530 a year. Candidates must be Corporate Members of the Institution of Electrical or Mechanical Engineers or equivalent. They should have had extensive experience of public electricity undertakings, with particular respect to the operation and maintenance of steam-powered station plant and associated equipment, including 66-kV substations.

SHIFT CHARGE ENGINEER
(M2C/49901/EF).

Salary in scale (including bonus and overseas and temporary allowances) £1,380 rising to £1,619 a year. Gratuity at rate of £150 a year whilst serving on temporary terms. Candidates, under 45 years of age, must have served an apprenticeship in an engineering works and have had considerable experience in the operation of a modern steam generating station. Preference will be given to candidates holding a recognised engineering qualification.

Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience, and quote the reference shown against the post applied for. 5337

ENGLISH ELECTRIC

Stafford

offer appointments in

TENDERING AND CONTRACT
ENGINEERING
for
HEAVY ELECTRICAL PLANT.

Applications are invited from electrical engineers to deal with the compilation of tenders and estimates and the co-ordination of contracts for the following types of heavy electrical plant.

MACHINES.
HEAVY SWITCHGEAR.
POWER TRANSFORMERS.

This work provides an opportunity to gain valuable experience of up-to-date heavy electrical techniques and applications as well as offering a secure and promising career in a stable industry.

Applicants should possess H.N.C. (E.) or higher qualification. Engineers who are in the last year of the course will, however, be considered.

Membership of the staff pension scheme and eligibility for three weeks' holiday follow a qualifying period of service.

Please write giving full details to Dept. C.P.S., Marconi House, 336/7, Strand, London, W.C.2, quoting reference ER.1297V.

5339

SOUTHERN RHODESIA GOVERNMENT

Department of Labour

Vacancy: Inspector of Machinery

APPLICANTS, under 43, must be qualified engineers in possession of an approved certificate in mechanical or electrical engineering or the Ministry of Transport First Class Marine Engineers' Certificate, and must have had good all-round experience. The duties will include the inspection of all classes of boilers, elevators and general machinery, and previous experience in inpection work of this kind, particularly the inspection and testing of boilers, will be a recommendation.

Salary scale £1,220 × £50 to £1,620.

Application forms and further details from Secretary (R), Rhodesia House, 429, Strand, London, W.C.2. Closing date 13th December, 1958. 5359

GOVERNMENT OF EASTERN NIGERIA

EXECUTIVE ENGINEER (Electrical), Public Works Department. To be engaged on estimates, design and specification of all electrical installations and to tour the Eastern Region inspecting and supervising the maintenance, installation and repair of all electrical equipment and wiring maintained by the P.W.D.

Contract appointment. Salary range £1,368 to £2,094 p.a. Gratuity of £37 10s. for each completed three months of resident service. Free passages for officer and wife and assistance of up to £450 towards cost of children's passages. Allowance in respect of children maintained in U.K. Quarters at low rent. Income tax at local rates. Generous home leave.

Candidates, between 25 and 45, must have either a degree in electrical engineering or be exempt from Parts I and II of the examination of the Institution of Electrical Engineers, with five years' practical experience including wiring, automatic control gear, refrigerators and air conditioning plant and diesel portable generating plant.

Write Director of Recruitment, Colonial Office, London, S.W.1, stating briefly age, qualifications and experience, quoting reference BCD.112/411/015. 5375

ROLLS-ROYCE

(Aero Division)

ROLLS-ROYCE LIMITED, Aero Engine Division, require an additional

SHIFT CHARGE ENGINEER

for operating electro-mechanical plant to be used for altitude testing of aero gas turbine engines at Derby.

The installation comprises six 20,000-h.p. motor compressor sets, cooling and regeneration turbines, large heat exchangers, refrigeration plant, cooling towers, electro-hydraulic and pneumatic control systems and other ancillary services. The total installed h.p. is 150,000, with a supply voltage of 33,000 v.

Applicants should have sound technical training and practical experience in the operation of this type of equipment. Appropriate technical qualifications would be an advantage.

The appointment carries a basic salary of £1,085 per annum, which is progressive, in addition to which there is a shift allowance.

Applications will be treated in the strictest confidence, and those selected for interview could be seen either in Derby or elsewhere as convenient.

Candidates should write for an application form to :—

The Manager
Technical Administration (GS)
Aero Division
ROLLS-ROYCE LIMITED
P.O. Box 31, Derby

5354

BRAINTREE COLLEGE OF FURTHER EDUCATION

Braintree, Essex

GRADE B ASSISTANT TEACHER required from January, 1959, or as soon after as possible. Candidates should have at least a Higher National Certificate in Electrical Engineering, together with industrial experience.

Salary £650 × £25 to £1,075, with additions for degree or equivalent and approved training. Increments within scale for previous teaching service, approved industrial experience and war/national service.

Details and forms (stamped addressed foolscap envelope) from the Clerk to the Governors, Mid-Essex Technical College, Market Road, Chelmsford. 5395

Situations Vacant *(continued)*

ROYAL NAVAL SCIENTIFIC SERVICE

SENIOR SCIENTIFIC OFFICERS and SCIENTIFIC OFFICERS required for establishments in London area, Baldock, Portsmouth, Portland, Poole, Greenock and Rosyth. Main requirements are about 25 vacancies for PHYSICISTS, ELECTRONIC ENGINEERS and MATHEMATICIANS in areas specified.

The following particular vacancies also exist: MECHANICAL ENGINEER for work on gas turbine problems in the London area. MECHANICAL ENGINEER for work on design and development of U/W devices in Portland area. METALLURGISTS for Rosyth and Poole. CHEMISTS (Physical and Inorganic) for Poole area, Baldock and London.

Candidates must normally be natural-born British subjects of natural-born British parents, with at least First or Second Class Honours degrees or equivalent high professional attainments. S.S.O.s must have had at least three years' postgraduate experience and be not less than 26 years of age.

Salaries (men): S.S.O. £1,190 - £1,410; S.O. £635-£1,110 (London); somewhat lower in Provinces. Appointments unestablished (with F.S.S.U. benefits), but opportunities may occur for those between ages of 21 and 32 to compete for established posts.

Forms from M.L.N.S., Technical and Scientific Register (K), 26, King Street, London, S.W.1, quoting A98/8A. 5164

NORTHAMPTON COLLEGE OF ADVANCED TECHNOLOGY, LONDON

APPLICATIONS are invited, especially from those in industry, for the following appointments:—

(a) SENIOR LECTURER in Electrical Power.
(b) LECTURER in Electrical Circuits and Machines.
(c) ASSISTANT LECTURER in Electrical Engineering.

The work of the department is concerned with Degree, and Sandwich (Dip. Tech.) and postgraduate courses in Electrical Engineering.

The posts provide facilities for research, development and experience in industrial liaison. Applicants should possess a Degree in Electrical Engineering.

Salary scales:—

Senior Lecturer, £1,350 × £50 to £1,550 per annum.
Lecturer, £1,236 × £30 to £1,398 per annum.
Assistant Lecturer, £800 × £25 to £1,175 per annum.

Plus, in each case, London allowance of £36 increasing to £48 at age 37.

Particulars and form of application from the Secretary, Northampton College of Advanced Technology, St. John Street, London, E.C.1. 5333

SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable appointments in the Transmission Section of the Chief Engineer's Department.

1. FOURTH ASSISTANT ENGINEER (Board Headquarters, Glasgow) (Ref. No. E44/58). Salary £810/£1,035 per annum.

The successful candidate will require to carry out relief duties in the transmission sections throughout the Board's district. Experience on 132-kV lines and substations is essential.

2. FOURTH ASSISTANT ENGINEER (Kilmarnock) (Ref. No. E45/58). Salary £710/£935 per annum.

Experience on 132-kV lines and substations will be an advantage.

Candidates should be in possession of a Higher National Certificate in Electrical Engineering.

The salary for these posts will be in accordance with Class AX/EX, Grade 7 and Grade 8 respectively of Schedule B to the National Joint Board Agreement.

Apply, quoting appropriate reference number on standard form A.E.6, available from the Secretary, P.O. Box 173, 351, Sauchiehall Street, Glasgow, C.2, not later than SATURDAY, 15th NOVEMBER, 1958. 5409

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:—

Board Headquarters

ENGINEERING DRAUGHTSMAN (Chief Engineer's Department). Applicants should have experience of schematic system and load flow diagrams, and be capable of detailing and preparing drawings associated with overhead line equipment. Workshop experience essential. Technical qualifications desirable. Salary within the range £595/£715 per annum according to qualifications and experience (N.J.B. Grade D.6).

Apply by letter within 14 days, stating age, experience, present salary and position, to the Secretary (Ref. FWC), Midlands Electricity Board, Mucklow Hill, Halesowen, near Birmingham.

Wolverhampton and District Sub-Area

GENERAL ASSISTANT DISTRICT ENGINEER (Cannock District). The successful applicant will be required to assist in the construction and maintenance of overhead and underground mains and substations. Technical qualifications desirable. Salary £590/£635 per annum (N.J.B. Grade E.12).

Apply by letter within 14 days, stating age, experience, present salary and position, to Mr. D. Holt, Sub-Area Manager, Midlands Electricity Board, 83, Darlington Street, Wolverhampton.

A. STEPHENS,
Secretary. 5394

UGANDA ELECTRICITY BOARD

THE Board requires for its permanent staff ASSISTANT ELECTRICAL ENGINEERS with ability and initiative. Interesting and extensive developments on transmission and distribution schemes are in hand.

Experience in the construction, operation and maintenance of an electricity supply network including overhead lines and substations with voltages up to at least 33 kV is essential. Experience at higher voltages is desirable.

Applicants should either be Corporate or Graduate Members of the Institution of Electrical Engineers, or have technical qualifications leading to that status, and a minimum of two years' experience in the electricity supply industry.

Salary scale £1,125 × £35 to £1,440. Entry point according to age and experience.

Uganda has a pleasant climate and income tax is moderate. Free passages, partly furnished accommodation, medical and dental treatment. Five days' leave for every completed month of service in East Africa. Normal tour of duty 24 to 36 months.

Applications must be on forms available from the London Representative, Uganda Electricity Board, Uganda House, Trafalgar Square, London, W.C.2, who will also supply further information. Completed forms should be returned to him before 24th November. 5360

PATENT OFFICE: EXAMINERS
(Men and Women)

for scientific, technical and legal work on patent applications. Age between 21 and 35; extension for Regular Forces service and Overseas Civil Service. Qualifications: normally first or second - class honours degree in physics, chemistry, engineering, metallurgy or mathematics, or equivalent attainment, or professional qualification, e.g., A.M.I.C.E., A.M.I. Mech.E., A.M.I.E.E., A.R.I.C.

London salary (men) £635-£1,410; provision for starting pay above minimum. Good promotion prospects.

Apply Civil Service Commission, 30, Old Burlington Street, London, W.1, for application form, quoting S128/58, and stating date of birth. 5335

WOOLWICH POLYTECHNIC
London, S.E.18

APPLICATIONS invited for an ASSISTANT GRADE B in Electrical Engineering. Candidates should have a good degree and some industrial experience; opportunities for research for a higher degree for suitable candidates.

Salary within £650 - £1,200 according to qualifications and experience, plus London allowance of £36 - £48.

Particulars and application form from Clerk to Governors, to be returned by 21st November, 1958. 5352

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Division

APPLICATIONS are invited for the appointment of ASSISTANT MANAGER of the Central Workshops at Hams Hall, Lea Marston, Sutton Coldfield, Warwickshire.

The workshops will be engaged on the repair of all types of power station plant, both electrical and mechanical, covering the whole range from small parts of the auxiliary equipment to the main components of large steam turbo-alternators.

Candidates should have had a sound engineering training, management experience and preferably hold a recognised technical qualification. Knowledge and experience of repair and maintenance of power station plant, electrical and mechanical, will be an advantage.

Salary in accordance with Grade 3 of Schedule B of the National Joint Board Agreement, £1,330-£1,595 per annum.

Applications to be submitted on form AE6, obtainable from the Establishments Officer, Central Electricity Generating Board, Midlands Division, 53, Wake Green Road, Moseley, Birmingham, 13, quoting vacancy number 885MD.

Closing date for applications will be 20th November, 1958. 5384

LEE GUINNESS LIMITED

require a

SENIOR DESIGNER DRAUGHTSMAN

experienced in the design and layout of L.T. Automatic Contactor type Control Gear.

Applicants should have had at least five years' experience in a similar capacity and should preferably have reached Section Leader status with qualifications of H.N.C. or equivalent.

This is a key appointment in an expanding organisation offering great scope to the right man who will have the opportunity of quickly achieving the status of Chief Draughtsman. Commencing salary will be within the range of £900-£1,200 p.a.; a generous pension scheme is in operation and assistance will be given with moving expenses and accommodation.

Applications, which will be treated in confidence, should give details of age, training, technical qualifications, experience and present salary and should be addressed to the General Manager, Lee Guinness Limited, Newtownards, Northern Ireland.

5408

SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for the superannuable position of DEPUTY SUPERINTENDENT at Bonnybridge Generating Station, near Falkirk, Stirlingshire.

Applicants should possess qualifications of not less than Higher National Certificate standard, and preferably be corporate members of one of the senior engineering institutions. They should also have had considerable experience in the operation and maintenance of generating stations.

Salary N.J.B. Schedule A, Class F, Grade 3, £1,160/£1,235 per annum.

A house may be made available for the successful candidate.

Applications on the standard form should be sent to the Secretary, South of Scotland Electricity Board, 168, Broomhill Drive, Glasgow, W.1, not later than 21st November, 1958.

5376

CENTRAL ELECTRICITY GENERATING BOARD

South Western Division

GENERAL ASSISTANT ENGINEER (Efficiency) required at Castle Meads Power Station, Gloucester.

Superannuation scheme. Salary N.J.B. Class E, Grade 11, £635-£680.

Duties will be of a general engineering nature in connection with efficiency, instrumentation, and technical records. Applicants should preferably possess a Higher National Certificate.

Applications on form A.E.6/ACT, obtainable from the Divisional Secretary, 26, Oakfield Road, Bristol, 8, should be completed and returned by 15th November, 1958. 5385

JAMES SCOTT & CO. (ELECTRICAL ENGINEERS) LTD.

SHOWROOM

JAMES SCOTT & CO. (Electrical Engineers) Ltd., 80/110, Finnieston Street, Glasgow, C.3, invite applications for an ELECTRICAL SHOWROOM MANAGER for their principal showroom in Glasgow.

The position carries a generous salary, commission and participation in the company's pension scheme.

Applicants should have :—

1. An expert knowledge of all domestic electrical equipment, with technical and commercial aspects.
2. A vigorous and imaginative selling initiative.
3. A sound knowledge of administration, particularly in relation to stock control and management.
4. Capacity to train, lead and manage staff.

Apply in writing to the Managing Director, James Scott & Co. (Electrical Engineers) Ltd., 80/110, Finnieston Street, Glasgow, C.3. 5393

SALES ENGINEER
(Inside)

O.N.C. (Elect.) minimum.

FOR preliminary design of electrical equipments, cost estimation, preparation of tenders and customer liaison. Rectifier switchgear or transformer experience an advantage.

Competitive salary. Non-contributory pension scheme.

Accommodation will be available shortly after engagement. Subsistence allowance paid whilst awaiting same. Removal expenses paid.

Please write, stating relevant particulars, to :—

Personnel Manager
STANDARD TELEPHONES AND CABLES LTD.
Rectifier Division
Edinburgh Way, Harlow, Essex

5396

SIMPLEX ELECTRIC COMPANY LTD.

have vacancies for Technical Staff at

THE CREDA DESIGN CENTRE

in London (adjacent Alperton Underground Station).

Present requirements are for :

PROJECT ENGINEERS: Graduates with ability to foster the development of a product through all stages and with experience of domestic appliances, motorised or otherwise.

DESIGNERS, with experience of domestic appliances and sound knowledge of design for modern production methods.

TECHNICAL ASSISTANT, familiar with engineering laboratory techniques and a real interest in development work.

Written applications with full details of industrial experience and salary expected will be received in strict confidence by the Secretary, Simplex Electric Co. Ltd., Oldbury, Birmingham. 5166

RUBBER IMPROVEMENT LTD.
Wellingborough

require ELECTRICAL AND INSTRUMENT ENGINEER who must have a wide knowledge and practical experience of electrical and control instruments employed on rubber and plastics manufacturing machinery of all kinds.

The appointment carries a good salary, and a non-contributory staff pension and life insurance scheme is in operation.

Applications, which will be treated in strict confidence, should be addressed to the Secretary. 5338

ELECTRICAL AND MECHANICAL ENGINEER

required by GOVERNMENT OF ST. HELENA for three years in first instance either on probation with prospects of permanency or on contract. Salary £900 a year. Free unfurnished quarters. Free passages for officer and wife and assistance towards children's passages. Liberal leave on full salary.

Candidates must be capable of undertaking responsibility for all electrical and mechanical engineering in the Colony, primarily maintenance and control of existing power station which generates a 230-volt L.T. and 3,300-volt H.T./A.C. supply distributed mainly by overhead lines from two 112-h.p. and one 25-h.p. Blackstone diesel generators. They must also be able to maintain and control all government vehicles, cranes and machinery and all staff and labour connected therewith.

Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience, and quote M2C/50369/EF. 5362

JOSEPH LUCAS (ELECTRICAL) LIMITED

ASSISTANT ELECTRICAL DESIGN ENGINEER

required for the design of rotating electrical machines and electro-magnetic devices. Projects will include fundamental design investigations, and full scope will be given for initiative and imagination.

The post is permanent and pensionable.

Apply in writing stating age, qualifications and experience to the Personnel Manager, Joseph Lucas (Electrical) Limited, Great King Street, Birmingham, 19, quoting reference PM/D/221.

125

JOSEPH LUCAS (ELECTRICAL) LIMITED

Great King Street, Birmingham, 19

ENGINEER

EXPANSION of development of ignition equipment for gas turbines and allied projects creates a vacancy for a practical engineer with experience of design for economic production of electrical apparatus. The work is of a high technical standard and applicants should preferably possess an honours degree.

The post is permanent and pensionable and offers considerable scope for advancement to a progressive engineer.

Apply in writing stating age, qualifications and experience to the Personnel Manager, Joseph Lucas (Electrical) Ltd., Great King Street, Birmingham, 19, quoting reference PM/D/190.

128

ELECTRICAL ENGINEER

wanted by leading German manufacturer for German-English translations. Applications are invited from British-trained engineers with a good general education and sound technical training, preferably also with practical experience in the application of electric equipment. Good working knowledge of German is essential. The ability to write clearly and concisely will be expected of candidates.

A five-day week is worked with generous holidays. Favourable housing conditions for permanent staff.

Apply, stating age, education, qualifications, experience and salary required, to—Box 5355.

NORTH WESTERN ELECTRICITY BOARD

ENGINEERING DRAUGHTSMAN, SUB-AREA ENGINEERING DEPARTMENT, BLACKBURN. Applicants should have had a good technical training with drawing office experience. The duties of the post will include the layout and detailing of indoor and outdoor substations up to and including 33,000 volts, together with diagrams of connections of the associated switchgear, transformer and protective systems.

Salary scale £595 × £20 to £715 p.a., Schedule D, Grade 6. N.J.B. conditions.

Applications, naming three referees, to Sub-Area Manager, No. 5 Sub-Area, North Western Electricity Board, Jubilee Street, Blackburn, by 15th November, 1958. 5332

ESSO PETROLEUM COMPANY LIMITED
Esso Refinery
Fawley, Nr. Southampton

ESSO PETROLEUM Company Ltd. have vacancies on their staff for an ELECTRICAL PROJECTS ENGINEER and an INSTRUMENTS PROJECTS ENGINEER. Candidates should be graduates or of graduate status and experience in the petroleum or allied industries would be an advantage.

There is an excellent pension scheme and recreational facilities of all kinds are available in a pleasant rural area bordering Southampton Water.

Applications, which will be considered in strict confidence, should be addressed to the Employee Relations Superintendent at the above address.

5377

YORKSHIRE SWITCHGEAR AND ENGINEERING CO. LTD.
Leeds, 6

invites applications for the following posts :—

SALES ESTIMATING AND CONTRACTS ENGINEERS.

Minimum qualifications O.N.C. in Electrical Engineering, but individual consideration would be given to non-qualified but experienced applicants.

Applications, which will be guaranteed strict confidence, must state age, experience and salary required. 5259

ELECTRICAL INDUSTRIAL HEATING

DESIGNING ELECTRICAL ENGINEER-TECHNICIAN-DRAUGHTSMAN required to assist director with development of heaters and elements and works management. Progressive opening throughout for keen young man with small progressive engineers, outskirts S.W. LONDON. Please write stating age, experience and present salary.—Box 5378.

THERMODARE (GREAT BRITAIN)

TECHNICAL staff required for heating design work in London office. Knowledge of thermal storage and floor heating design an advantage. Opportunity to join technical sales dept. of rapidly expanding company.

Write with full particulars to 94/98, Petty France, London, S.W.1. 9526

A SWITCHGEAR sales engineer is required by the Crompton Parkinson Associate Company in Canada. First-class professional qualifications are essential, and preferably some experience on switchgear design, estimating and manufacturing. This appointment is to a large organisation already established in the Canadian market and offers outstanding opportunity. Written applications to Ref. MD/P2, Crompton Parkinson Limited, Crompton House, Aldwych, London. W.C.2. 5366

ARON ELECTRICITY METER invite applications for the position of indoor sales engineer. Applicants are required to have a sound technical background, preferably applied to electricity meters and electronic equipment. Superannuation scheme in operation. Applicants should supply full details of experience, age, and salary required, and replies, which will be treated in the strictest confidence, should be marked "Personal" to the General Sales Manager, Aron Electricity Meter Limited, 72-82, Salusbury Road, London, N.W.6. 5161

Situations Vacant (continued)

AREA representative. First-class representative required for the London area by a leading manufacturer of domestic and industrial heating equipment. Must be fully experienced in this field. Sound connections with area electricity board, electrical wholesalers and retailers is essential. Write giving details of age, education, qualifications and experience to—Box Z789, Willing's, 362, Grays Inn Road, London, W.C.1. 5398

ASSISTANT draughtsmen, experienced, for lighting and power schemes for hospital, office and school buildings, also specifications. Annual bonus, five-day week and 3 weeks' holiday. Consulting engineers, Holborn (London) area.—Box 5284.

ASSISTANT electrical engineer. Electric motor control gear manufacturers require young assistant in design office with knowledge of electronics. Progressive position, contributory pension scheme.—Box 5246.

ASSISTANT engineer required for large London contractors. Excellent prospects and permanent position for intelligent young man with initiative. Write giving full details to—Box 5283.

AUTOPHONE Ltd. require telecommunications engineer capable of assisting in developing automatic and loudspeaking telephone equipment. Ability to write technical descriptions desirable. Good salary, prospects and working conditions. Write with brief details to—Autophone Ltd., 539, Wandsworth Road, London, S.W.8. 5367

CABLE estimator required in London. Experience in rubber and plastic cable design and estimating. Age 20/25. Write full details in strict confidence to—Box ER.849, c/o 191, Gresham House, London, E.C.2. 5341

CABLE estimator with experience in paper mains cable design and costing required in London. Age 25/30. Write in strict confidence stating experience and salary required to—Box ER.850, c/o 191, Gresham House, London, E.C.2. 5340

C.M.A. cable company near London has a vacancy for a general sales manager. Knowledge of all types of cables essential. Salary in accordance with experience. Contributory pension scheme.—Box 5399.

C.M.A. cable works near London manufacturing paper, rubber and plastic cables require technical order clerk. Ordinary Nat. Cert. would be an advantage. Previous experience essential. Salary in accordance with experience. Contributory pension scheme.—Box 5368.

CONTRACTS engineer, age about 30, required by established contractors in S.W. Midlands town, to take over busy section, 20 pairs and staff. £1,000 p.a. for a capable man, or more according to experience, with excellent prospects. Replies treated in strictest confidence. Secretary—Box 5400.

COUNTER assistant required for wholesale electrical department. Experience essential. Apply with references to—Messrs. Wm. Dibben & Sons Ltd., East Street, Farnham. 5286

DRAUGHTSMAN required immediately with experience on electro-mechanical instrument design. Good conditions, five-day week. Apply—Hendrey Relays Limited, 392, Bath Road, Cippenham, Slough. 5379

DRAUGHTSMAN (senior) required, preferably with experience in the design of fractional to 10-h.p. electric motors. Varied and interesting work. Staff pension scheme. Salary according to experience and qualifications. Please apply to Personnel Manager, Small Electric Motors Ltd., Eagle Works, Churchfields Road, Beckenham, Kent. 5397

DRAUGHTSMEN, electrical, for engineering consultants. Knowledge of power station work an advantage. Positions permanent, pensionable, five-day week, free lunches. Write or phone Personnel Officer, Ewbank & Partners, 10/11, Grosvenor Place, Hyde Park Corner, London, S.W.1 (SLOane 0486). 5369

ELECTRICAL engineer required by Scottish Special Housing Association Limited to prepare drawings, specifications, schedules and estimates in connection with electrical installations in 3-storey, 4-storey and multi-storey flats, incorporating floor warming, space and water heating, lifts, laundries, etc. Applicants should possess not less than the qualifications of the Institution of Electrical Engineers. Salary scale £1,066-£1,255 per annum. Forms of application with full particulars from the Secretary, 15/21, Palmerston Place, Edinburgh, 12. 5402

DRAUGHTSMEN for South Manchester office. Interesting work on layouts and diagrams, 33 and 11-kV switchgear, transformers, cables, etc. Apply — South Wales Switchgear Ltd., Rex Buildings, Wilmslow, Cheshire. 5287

ELECTRICAL and radio distributor has vacancies for progressive men aged 25/45, capable of accepting responsibility and with comprehensive knowledge of all aspects of electrical wholesaling. Apply in first instance stating age and full details of experience to Managing Director, The Wholesale Fittings Co. Ltd., 46/52, Commercial St., London, E.1. 5355

ELECTRICAL engineer required by West Midlands firm for work in development laboratory on discharge lamp circuits and control gear. H.N.C. or equivalent qualification desirable.—Box 5247.

ELECTRICAL, mechanical engineer/draughtsman, experienced in estimating and supervising manufacture of electrical equipment for the printing trade. Knowledge of costing an advantage. N.W. London. Apply giving full details of experience and state salary required to—Box 5370.

ELECTRICIANS seeking regular employment required by small but expanding North London contractor. Five-day week.—Box 9530.

ENGINEERING assistant required by small London contractors. Able to handle from enquiry to final account. Interest offered when established. Write experience, age, etc.—Box 9528.

EXCELLENT opportunities exist for qualified and experienced engineers in an expanding department dealing with control gear applications. Previous experience in this class of work and the ability to work on own initiative are essential. Salary will be commensurate with qualifications and experience, and the prospects of advancement are excellent. Please write giving full details to — The Chief Engineer, Simplex Electric Co. Ltd., Broadwell, Oldbury, Birmingham. 5342

EXPERIENCED engineer req. by leading electrical contractors. Must be capable of design and estimating. Write giving age, experience and salary req.—Box 5372.

FOREMAN electrician required for large factory in London area to supervise maintenance of H.V. and M.V. motors up to 600 h.p. and H.V. and M.V. switchgear and lighting. Applicants should be preferably of H.N.C. standard and capable of supervising industrial installation work. Permanent post, staff pension scheme, financial assistance for house purchase if required. Write, stating age, qualifications, experience and salary required to—Box 9527.

FOSTER TRANSFORMERS Ltd., South Wimbledon, London, S.W.19, have vacancies for testers for work on all types of transformers up to 3,000 kVA. Applicants should have had some training or experience in the electrical industry. Apply in first instance giving details of experience and salary required to the Personnel Officer. 5174

IF you reside in the London area, have technical experience in medium-voltage airbreak switch and distribution gear, are 35 to 40 years of age, with experience and contacts with electrical consultants and architects, and are interested in joining a well-known manufacturer's sales staff to work from London office as a technical representative, there is a very interesting position available. Write to—Box 5289.

LONDON E.W.F. wholesaler requires immediately young man in pricing office. Only those with previous experience should apply. Give full particulars in confidence to—Box 5191.

MANAGER for retail dept. of Worcester contractors. Must have knowledge of retail trade and be able to sell refrigerators, T.V. and Hi-Fi. Responsible for staff, buying, stock, display. Flat available on premises.—Box 5401.

PRODUCTION supervisor, extrusion dept., plastic cable factory. Write details age, experience, salary required. — J. Day & Co., Harrow Manorway, Abbey Wood, London, S.E.2. 5357

RADIO serviceman required in Nigeria to service domestic radio receivers and tape recorders sold by a large retail organisation. Must be capable of controlling a workshop and supervising and training local mechanics. Contract of 24 months at a salary of £1,250 p.a. with possibility of further contracts. Free passages, free fully furnished accommodation and family allowances with gratuity on satisfactory completion of contract. Reply stating age, qualifications and experience to—Box 5373.

OVERHEAD foremen and linesmen wanted for pole work up to 33 kV. Good hours, permanent position, London rate for right people.—Box 5177.

OVERHEAD line engineers required for consulting engineers' staff in Scotland, with opportunities overseas service later, age group 25-35 preferred. Dual experience steel tower lines up to 132 kV and wood pole construction up to 33 kV desirable. Applicants please send outline of technical training and overhead line experience to—Kennedy & Donkin, 3, North Charlotte Street, Edinburgh, 2. 5264

REPRESENTATIVE required for London and South of England by progressive company supplying essential components to the electronic and electrical industries. Applications are invited from men in the age group 25-30, possessing keenness and initiative, and having sound commercial experience. Salary will be in accordance with age and qualifications. A compulsory pension scheme is in operation and a company's car will be supplied. Apply in writing to — Sales Manager, Telcon-Magnetic Cores Ltd., Chapelhall, Airdrie, Lanarks. 5371

REPRESENTATIVE required, progressive electrical wholesaler. Experience and existing connection with contractors and industrial users essential. Salary, commission and expenses. Car provided. Write details—Finch Wholesale Electrics Ltd., 550, Ley Street, Ilford, Essex. 5234

ROTATING electrical machine designer required to head newly formed research and development dept. Splendid opportunity for experienced man with ambition. Age preferably between 28 and 35.—Box 5253.

SALES department. Enthusiastic young man required by a firm manufacturing electrical rotating machines to take a leading position in sales department. Apply in confidence giving full details of previous experience, age and salary.—Box 5254.

SANTON Ltd. have a vacancy in London for a young man up to 25 approximately as junior sales assistant in the rotary switch division. The successful applicant will be required to deal with technical enquiries, orders, sales records and general correspondence of a technical nature. A basic electrical training is essential and some experience in these duties desirable. Applications by letter only to—Santon Ltd., Santon House, Old Oak Common Lane, London, W.3. 5344

SENIOR supervising electrical engineer required for large London contractors. Good prospects and permanent position. Write giving full details to—Box 5282.

SERVICE engineer required for company manufacturing full range of electricity meter products. Experience of electricity meters desirable but not essential. Applicants must have sound technical background and be prepared to travel throughout the British Isles. This position offers first-class opportunities for further advancement. Applicants should supply full details of experience, age and salary required. Car supplied and superannuation scheme. Replies, which will be treated in the strictest confidence, should be marked "Personal" to the General Sales Manager, Aron Electricity Meter Limited, 72-82, Salusbury Road, London, N.W.6. 5160

STOREKEEPER. Must be thoroughly experienced and only those who have worked for an electrical wholesale company for many years need apply. Applications by letter only stating full details.—Halsey's Electric Co. Ltd., Brandon House, Wyfold Road, Fulham, London, S.W.6. 5179

TECHNICAL writer required by automatic control engineers to prepare write-ups for technical journals, catalogue sheets, data sheets, instruction material for pressure, temperature and humidity control equipment. Some technical training will be necessary, but knowledge of equipment and its applications not essential. Knowledge of U.D.S. classification system an advantage. Apply — Personnel Department, Thermocontrol Installations Co. Ltd., 2 - 10, Valentine Place, Blackfriars Road, London, S.E.1. 5343

TRANSFORMER engineer required by the British Electric Transformer Co. Ltd. for tendering and technical correspondence. Applicants must be fully experienced in this class of work and should be educated up to H.N.C. standard. Full particulars of age, experience and salary required to the Personnel Officer, The British Electric Transformer Co. Ltd., Hayes, Middx. 5345

X-RAY service engineers required for London and the Home Counties. Must be experienced in the installation and maintenance of medical X-ray equipment. Apply in writing giving full details of training, experience and present salary to A. E. Dean & Co. (X-Ray Apparatus) Ltd., Progress Way, Croydon, Surrey. 5193

YOUNG engineer is required by a contracting firm operating in South and East England. Applicants should have some experience of the supervision of high and low-voltage cable laying and jointing, and switchgear erection. The applicant will have the opportunity of furthering his experience in the above field and also in that of estimating for large and varied projects.—Box 5265.

APPOINTMENTS FILLED

Dissatisfaction having so often been expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision? We will then insert a notice free of charge under this heading.

SITUATIONS WANTED

ADVERTISER, many years with well-known London electrical contractors, desires change. Extensive administrative experience in all branches including staff control. Only progressive post with good remuneration considered.—Box 9523.

ELECTRICAL and mechanical engineer, erection and running diesel power stations and networks up to 11 kV, ten years Middle East, available end of year, desires overseas position. Married, age 43. English. — Box 9525.

ELECTRICAL engineer, experienced in running diesel stations and distribution systems up to 33 kV, desires further senior position overseas.—Box 9529.

ENGINEERING sales manager, A.M.I.E.E. (34), single, seeks further executive appointment in Singapore, Malaya, Indonesia or Hong Kong. Comprehensive engineering/commercial experience in wide range of electrical and mechanical plant, etc. First-class references. Available early January, 1959.—Box 9513.

EST./supervising engr. desires change, pref. Southern area. Fully exp. contracts, enquiry to final acct. including sales. Progressive position essential.—Box 9522.

EXPERIENCED sales engineer, age 40 years, 26 years electrical trade, seeks change as sales manager or senior sales engineer. Excellent connections Govt. dept. boards, public bodies, big users, wholesalers.—Box 9517.

MAN with long practical experience in electrical engineering, specialising in motor and generator repair trade, having administrative and organising ability, desires engagement in position of trust. Own car and testing instruments. Resident Croydon district.—Box 9531.

SALES BY AUCTION

E. R.

By Order of the Secretary of State for Air

No. 14 M.U., R.A.F., CARLISLE
(Goods stored at Blackwood, 9 miles north of Carlisle)

SALE BY AUCTION
Thursday, 20th November, 1958, at 10.30 a.m.
SALE IN THE COUNTY HALL, CARLISLE.

425 LOTS OF ELECTRICAL AND INDUSTRIAL MACHINERY & SUNDRIES

including Dynamos, Air Blowers and Motors, Platform Hoists, Motor Generators, Transformers, Armatures, Air Conditioning Equipment, Accumulators, Compressors, Motor Vehicle Sundries and Spares for Thornycroft, Leyland, Austin and Bedfords. Watches, Compasses, Marching Compasses, Tachometers, Amplifiers, Receivers, Transmitter-Receivers, Fire Extinguishers, and many sundries.

VIEWING Tuesday and Wednesday, 18th and 19th November, 9 a.m. to 4.30 p.m., and on Sale morning to 10.30 a.m., at Blackwood, Longtown. See catalogue for details.

CATALOGUE, 1s., admits two to viewing but one only to Sale, from the Auctioneers :—

HARRISON & HETHERINGTON LTD.
Carlisle
(Phone Carlisle 26292/3; Grams, " Sales.")
5348

ARTICLES FOR SALE

NEWMAN

ONE new 1949 ENGLISH ELECTRIC Model 8RL Vertical Diesel Engine only, 1,000/1,144 b.h.p., 375/428 r.p.m., 800 kVA, 428 r.p.m.. Alternator and switchgear available.

TWO new 1950, 493-kVA PETTER/BRUSH Diesel-driven Alternator Sets, 600 r.p.m., 400/3/50 cycles, 4-wire output, with switchgear.

TWO new 1948, 236-kVA CHICAGO PNEUMATIC/L.D. & C. Diesel-driven Alternator Sets, 600 r.p.m. for 400/3/50 cycles, 4-wire output, with switchboards and synchronising panel.

ONE 220-kVA GENERAL MOTORS Model 8/268 Diesel-driven Alternator Set, 1,000 r.p.m. for 415/3/50 cycles, 4-wire output, with switchgear.

ONE 62½-kVA PAXMAN Model 5RW Diesel Alternator Set, 1,000 r.p.m. for 400/3/50 cycles, 4-wire output, with switchgear.

ONE 110-h.p., 350-r.p.m. CROSSLEY twin-cylinder vertical Diesel Engine only, Model RVD2, with shaft extension and outer pedestal bearing.

All available for early despatch.

NEWMAN INDUSTRIES LIMITED
Yate, Bristol
(Telephone: Chipping Sodbury 3311)
5291

ROTARY CONVERTERS COMPLETE WITH TRANSFORMERS

2 BRITISH WESTINGHOUSE, 6,770 volts, 3-phase, 50 cycles, 4 H.V. tappings from 6,270 to 6,770 volts, 500 kW D.C., 430-490 volts, 3-wire giving 215-245 volts from outers to neutral.

1 BRITISH WESTINGHOUSE, 6,720 volts, 3-phase, 50 cycles, 5 H.V. tappings from 6,080 to 6,720 volts, 1,000 kW D.C., 440-490 volts, 2-wire.

1 METROPOLITAN-VICKERS, 6,700 volts, 3-phase, 50 cycles, 5 H.V. tappings from 6,100 to 6,700 volts, 1,000 kW D.C., 440-500 volts, 2-wire.

1 B.T.H., 6,800 volts, 3-phase, 50 cycles, tapping details unknown, 1,000 kW D.C., 470-520 volts, 3-wire, giving 235-260 volts from outers to neutral.

1 ENGLISH ELECTRIC, 6,800 volts, 3-phase, 50 cycles, 4 tappings giving ratios of 6,800 to 401.5, 392, 382.5 and 373 volts, 1,500 kW D.C., 480-520 volts, 3-wire, giving 240-260 volts from outers to neutral.

E. M. TATTON & CO. LTD.
59, Kew Bridge Road, Brentford
(EALing 3155/6) 5380

ELECTRICAL EQUIPMENT FOR SALE

10-kVA/10-h.p. D.C. and A.C. School or Laboratory Test Set. Output 25 to 60 cycles and 150/500 volts D.C.

Reconditioned Motors.

3-kVA, 230-volt, 1,000/1,100-cycle M.G. Set.

Diesel Alternator Sets.

562-kVA, 300-r.p.m. Alternator, 400/440/3/50 cycles.

Secondhand 5-cwt. Electric Blocks.

SOUTHERN & REDFERN LTD.
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VARIABLE SPEED MOTORS

500 volts D.C., with Control Gear

One	60 h.p.	480/1450	r.p.m.
One	45 „	850/1430	„
One	40 „	950/1120	„
Six	35 „	480/1450	„
One	35 „	900/2000	„
One	30 „	500/1500	„
Twelve	25 „	850/1420	„

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5383

ELECTRIC HOUSE SERVICE METERS

PREPAYMENT and credit, 200/250 v. A.C., s/p., 50 c., 2½-100 A. Fixed or variable tariff. Reconditioned, fully tested and guaranteed 2 years. Prompt delivery, carriage paid.

ALBERICE METER COMPANY
Fairfax Works, Fairfax Rd., London, N.8
(Tel. MOUntview 7944, 6373) 191

HOUSE SERVICE METERS

200-240-v. A.C. or D.C., 10 amps. capacity, quarterly type, from 25s. each, plus 2s. 6d. carr.

UNIVERSAL ELECTRICAL CO.
221, City Road, London, E.C.1 37

A.A. ELECTRICAL Co. for A.C.-D.C. motors, switchgear, exhaust fans, hoists, reduction gears, new or reconditioned units.—CHI. 5105. 67, Rothschild Rd., London W.4. 57

A BABCOCK & Wilcox water tube boiler will cut down your fuel costs; we can supply from stock. Two 40,000 lb. evap., 220 lb. w.p.; one 25,000 lb. evap., 200 lb. w.p.; 3,000 lb. evap., 400 lb. w.p.; Spencer Bonecourt boiler; also Marine, Cornish vertical, etc.—Burford, Taylor & Co. Ltd., Boiler Specialists, Burtayco House, Church Street, Middlesbrough (Tel. Middlesbrough 2622). 122

A.C. and D.C. motors, generators, from stock.—Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. (Edgware 5566/9). 91

A.C. and D.C. 1/- slotmeters. Guaranteed 2 years, 2½-50 amps. From 50/-. Repairs and recalibrations. See Billiard: Tradex Meter Co., Surbiton (Tel. Elmbridge 4487). 169

ALTERNATORS from ½ to 675 kVA in stock, single and three-phase, all voltages and frequencies. Guaranteed. Many unused. Send your requirements.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 162

ALTERNATORS, generators, 1-588 kVA, all voltages. Specialists—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 147

ALTERNATORS, 3-phase, all sizes in stock from 7 kVA up to 330 kVA.—Britannia Manufacturing Co. Ltd., 20/26, Britannia Walk, London, N.1 (CLErkenwell 5512). 24

BARGAINS in electric motors from A. Cooksley & Co. Ltd., 21/25, Tabernacle Street, London, E.C.2. Ring Monarch 3355. 50

BILLIARD Meters. 1/-, 6d. or 1d. slot. All time settings. From 140/-. See Quarterly.—Tradex, Surbiton. 170

CABLE, underground, all types ex stock.—E. M. Tatton Co., Ltd., Kew Bridge, Brentford (EALing 3155/6). 117

CABLE, underground, PILC/VIR/LC, ex London stock. Cutting orders same day delivery London area. Send for priced stock lists. — Batt Electrical Co., 6, Dock Street, London, E.1 (Tel. ROYal 5905). 316

CIRCUIT breakers, various sizes in stock, A.C. and D.C., 200 amperes up to 2,000 amperes. Also dynamo and alternator switchboards. — Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 26

CONVERTERS and motor-alternators, 24, 110 and 220 v. D.C. to 230/1/50 A.C., 300 watts to 6 kVA in stock.—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 150

CRANE motors. Direct current, series wound or compound wound, all voltages. We have large stocks.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 22

D.C./A.C. motor alternator set, 1,500-r.p.m. 32-h.p., 460-v. motor directly coupled on C.I. bedplate 25-kVA alternator, 400/440/3/50, starter control panel, A.V.R., £195 o.n.o.—Parker, 9/11, High Street, Sheerness. 406

DIESEL generating sets, all sizes to 500 kW. Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 16

ELECTRIC motors, dynamos, alternators and motor generator sets of all sizes. We hold one of the largest stocks in England. New and reconditioned, with 12 months' guarantee.—Britannia Manufacturing Co. Ltd., Britannia Walk, London, N.1 (Clerkenwell 5512, 3 lines); also Works and Stores, Chobham, Surrey. 20

ELECTRIC motors, generators, control gear, transformers, A.C. and D.C., new and reconditioned; all covered with our usual 12 months' guarantee; large stocks available.—Electropower Co. Ltd., Kingsbury Works, Kingsbury Road, London, N.W.9 (Colindale 4621-2). 42

ELECTRICIANS. Send for details Shaftesbury lightweight " Bantam " ladders. Top sections fitted with patent moulded rubber blocks, eliminate possibility of scratching or marking walls, fascias, and other painted or highly polished surfaces. Also available for immediate delivery, steps, platform steps, trestles, telescopic trestles, pole and builders-type ladders, and all sizes of two and three-section extension ladders.—Shaftesbury Ladders Ltd. (E.R.), 453, Katherine Road, London, E.7 (Phone: Grangewood 3363/4). 111

Articles for Sale (continued)

ELECTRIC motors, generators, motor generator sets, transformers, switchgear, etc., large comprehensive stock, overhauled and guaranteed. Copy of our Register, "Electrical Surplus," containing thousands of items of electrical plant, sent on request.—R. F. Winder Ltd., Belgrave Electrical Works, Leeds, 2. 54

ENGLISH leatheroid, 1½ tons in sheets 25 × 40 and 25 × 45, 7 mils thick at 2s. lb.—Loescher, 76, Albemarle Road, Beckenham, Kent.

FLAMEPROOF fluorescent fittings, 5 ft., 80 watts, by Revo, Cat. No. C.11474, as new. Large quantity available at less than half list price. Further details from — Leighton Warehouse Co. Ltd., 6, Church Road, Linslade, Leighton Buzzard (Tel. No. L.B. 3400). 9512

FLAMEPROOF Revo fluro. fittings, 5 ft., very cheap.—14, Camberwell Rd., London, S.E.5 (ROD. 4177). 5327

FLUORESCENT fittings, lamps, starters and control gear for home and export. Fully guaranteed by actual manufacturers. Send for catalogues. — The Anglo-American Electrical Company, Olive Street, Bury, Lancs. 245

FLUORESCENT tubes reconditioned and guaranteed as new for 7s. 6d. each. Free collection and delivery in Lancs and Yorks.—The Anglo-American Electrical Company, Bury New Road, Breightmet, Bolton, Lancs. (Telephone, Bolton 7251). 212

FOR sale, mercury arc rectifier, maker Hackbridge-Hewittic, input 400 volts, 3-phase, 50 cycles, output 230 volts D.C., 80 kW. B.T.H. variable speed commutator motor, 400 volts, 3-phase, 50 cycles, 40/8 h.p., speed 1,150/230 r.p.m.—Box 5405.

FOR sale, motor generator, rotary converter and Ward Leonard sets in a great range of outputs, speeds and control systems.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 161

FRACTIONAL h.p. motors, new, ex stock, A.C./D.C., Universal, B.T.H., Delco-Remy, G.E.C., Fracmo, Newman, Scophony. — Jeary Electrical Co. Ltd., 5, Lamb's Buildings, London, E.C.1. 126

FREQUENCY changers and variable frequency M/A sets in stock, and to specification.—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 148

GENERATING plants of all types, new and reconditioned up to 100 kVA in stock. Special plants built to order at short notice; automatic mains failure, etc. — Powerco Ltd., 312, York Rd., London S.W.18 (VAN. 5234). 151

GENERATING sets for sale, petrol, diesel and steam, from 1 kW up to 700 kW, A.C. and D.C. switchboards.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 163

GUILLOTINE, 24" bench type, c/w gauge, spare blade, etc. Brand new "Keetona." Surplus to requirements. £27 10s. o.n.o.—Millett & Co., 60a, Gladstone Road, Boscombe, Bournemouth. 5346

HIGH frequency alternators and converters, 400 to 2,600 cycles up to 6 kVA in stock. Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 149

LANCASHIRE Dynamo & Crypto alternator, 48 kVA, p.f. .8, 3-phase, 50 cycles, 400 v., 600 r.p.m., complete with exciter. Mftd. 1932. —Smith Brothers (Leicester) Ltd., Batten St., Aylestone Road, Leicester. 5213

MINIATURE decoration sets. 20, 40 and 70 Lilliput screw pea bulb sets, clear or coloured. Price on application.—L.C.E. Stores Ltd., 20/22, Cursitor St., London, E.C.4. 5403

MOTOR generator sets and converters, all sizes and voltages from ½ kW up to 500kW in stock. — Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, City Road, London, N.1 (Tel. Clerkenwell 5512, 5513 & 5514). 12

MOTOR generators of all types in stock and to specification up to approx. 100 kW.—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 152

MOTORS and control gear, huge stocks all types, ¼ to 200 h.p.—Ramsbottom & Co. Ltd., Elec. Engineers, Keighley (3774/5/6). 70

NAMEPLATES, engraving, diesinking, stencils. — Stilwell & Sons Ltd., 153, Far Gosford Street, Coventry. 108

POLYPHASE kilowatt hour meters. Available from stock.—Universal Electrical, 221, City Road, London, E.C.1. 40

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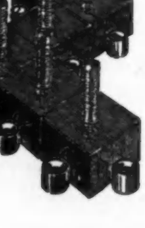

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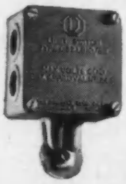

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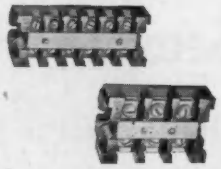

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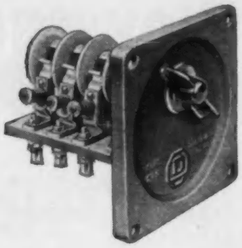

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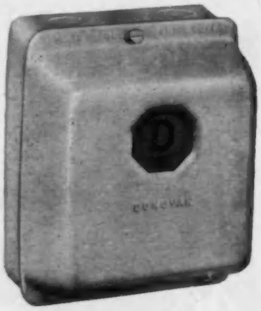

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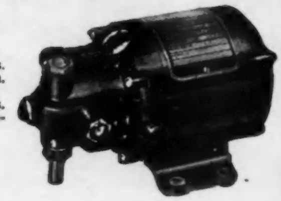

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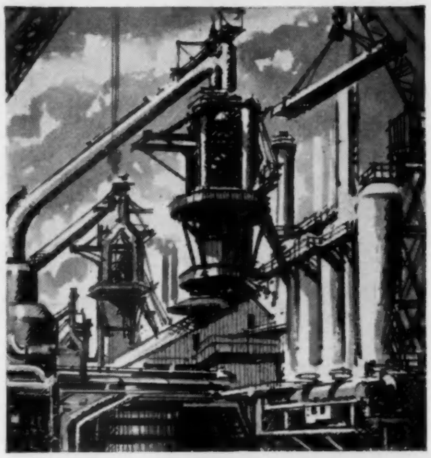
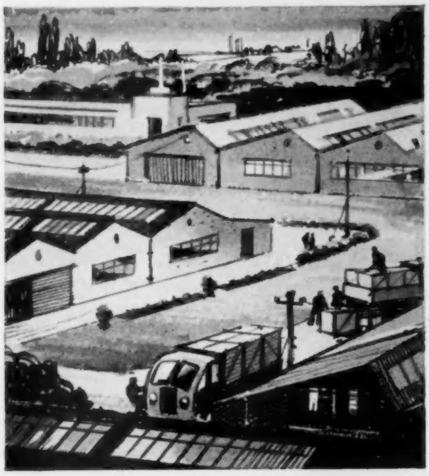
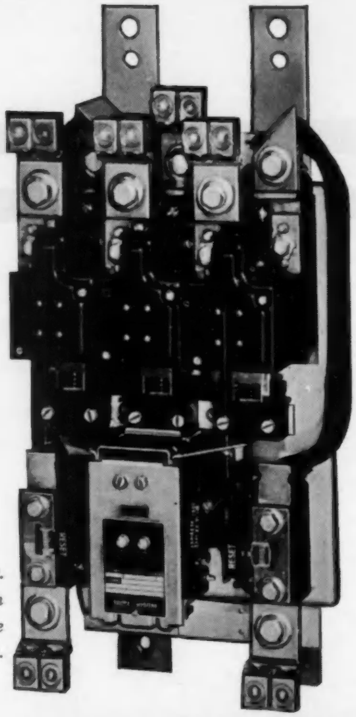
For every motor there is a Square D starter

THE PIONEERS IN VERTICAL ACTION DESIGN







200 H.P.
Vertical Action
Direct-on-line
Starter.

From general engineering up to the heaviest industry every starting need can be met by Square D. Industrial experience on the widest scale has made this range possible. Exceptional design and production skill has realised the highest standards of electro-mechanical reliability.

Wherever magnetic starters are required—regardless of the motor—they can be readily found from Square D.

In the direct on-line-range there are starters for non-reversing, reversing, and all multi-speed requirements. In the reduced voltage range there are Star-delta, Primary resistor, Auto-transformer, and Stator-rotor starters.

For information on the complete range, write for Bulletin 8536.

Only Square D vertical action starters give you these six advantages . . .

1. **Quick Installation.**
2. **Top performance.**
3. **Real overload protection.**
4. **Easy inspection and maintenance.**
5. **Wide range adaptability.**
6. **World-wide market acceptance.**

To have the best *Specify* Square D

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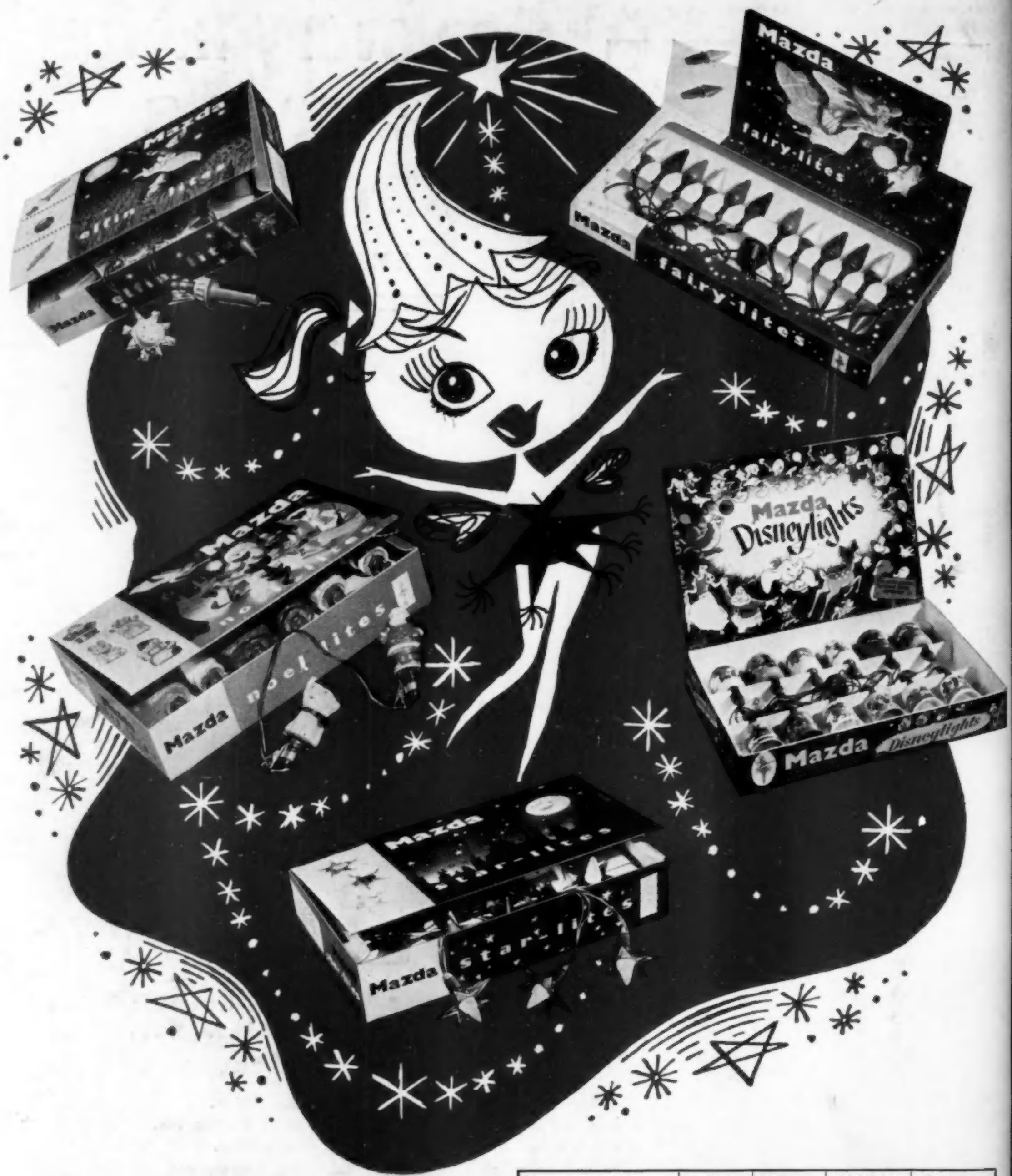
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Mazda decoration sets

. . . bring a brighter Christmas to you and your customers . . .

Make sure you are well stocked, in good time to meet the Christmas rush.

Description	Volts	Number of Lamps	List Price			Purchase Tax Extra	
			£	s.	d.	s.	d.
Disneylights	200/260	12	1	5	0	2	7
Fairy Lites				16	4	1	8
Elfin Lites			1	7	2	2	10
Star Lites			1	5	0	2	7
Noel Lites			1	12	2	3	4
Spare Lamp (Clear or Coloured 3W M.E.S.)	20	1		1	0		2½

Mazda *lamps stay brighter longer*

A.E.I. LAMP AND LIGHTING COMPANY LTD. *Lamp Dept:* Melton Road, Leicester

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